Section 5.1 Air Emissions Permits and Authorizations

5.1.1 Introduction

Tesoro-Savage Petroleum Terminal, LLC (Tesoro-Savage) proposes to construct a facility in Vancouver to receive crude oil by rail and transfer it to vessels. The Tesoro Savage Vancouver Energy Distribution Terminal (Facility) will emit air pollutants and therefore must obtain certain air quality permits before construction of the Facility can commence. Air permits are required for construction and operation of the emissions units associated with the stationary source. Emissions from mobile sources, including ships, trains, and vehicles, are regulated under other federal mobile source emission standards and are therefore not regulated or addressed under the stationary source air permitting process.

The Energy Facility Site Evaluation Council (EFSEC) is the lead state agency responsible for environmental permitting of facilities that have the capacity to receive more than an average of 50,000 barrels per day of crude or refined petroleum products that has been or will be transported over marine waters. EFSEC has responsibility for technical review of air quality concerns and for administering preconstruction permits. If a project is subject to the major source permit program (see section 5.1.3.3.2), as this project is, the United States Environmental Protection Agency (USEPA) co-signs the major source permit.

Under Washington Administrative Code (WAC) 463-78-005, EFSEC has adopted by reference the general air quality regulations Ecology has established in Chapters 173-400, 173-401, 173-406, and 173-460.[25] It should also be noted that regulations established by the Southwest Clean Air Agency (SWCAA) do not directly apply to the Facility. However, SWCAA regulations are discussed in this application to demonstrate that even if the local regulations did apply, the Facility would be compliant.

5.1.1.1 Organization

This section constitutes a combined Notice of Construction (NOC) and Prevention of Significant Deterioration (PSD) permit application. Although an air quality permit application typically begins with a project description, this permit application is a component of a broader Application for Site Certification. Section 2.3, Construction on Site, of this application provides a detailed project description.

Key components of this air quality permit application are as follows:

- Section 5.1.2 describes the components of the project that emit air pollutants and presents estimated emissions. Emissions are based on vendor information, emissions regulations, and the BACT analysis. A more detail discussion of BACT is included in Attachment 1.
- Section 5.1.3 identifies and discusses potentially applicable air quality regulations.
- Section 5.1.4 describes an air quality dispersion modeling analysis used to estimate concentrations of criteria pollutants and toxic air pollutants (TAPs) in the vicinity of the

[25] Because EFSEC has adopted the Ecology regulations by reference, this section cites directly the Ecology regulations for the reader's convenience.

project (i.e., Class II areas). Section 5.1.4 also compares predicted ambient concentrations with regulatory criteria.
- References are provided in Section 1.5, Sources of Information, of this Application.

The Facility is a minor source of all pollutants subject to regulation under the Clean Air Act with the exception of greenhouse gases. As a result, the Facility triggers major new source review exclusively for greenhouse gases. As no ambient air quality standards exist for greenhouse gases, the only applicable requirement in the greenhouse gas PSD process is a Best Available Control Technology (BACT) analysis. However, as noted above, this section also includes a state BACT analysis for the regulated air pollutants other than greenhouse gases, ambient air quality modeling for criteria pollutants and TAPs, and a list of applicable air quality standards.

5.1.1.2 Summary of Findings

This permit application is summarized as follows:

- Emissions units at the Facility will employ Best Available Control Technology to ensure emissions of all regulated pollutants are less than major source thresholds except greenhouse gases. Consequently, greenhouse gas emissions are addressed through the Prevention of Significant Deterioration permit process while all other emissions are addressed in a minor source Notice of Construction application.
- The Facility will comply with all federal and state emissions standards, including New Source Performance Standards and National Emissions Standards for Hazardous Air Pollutants.
- Predicted total concentrations of the criteria air pollutants emitted from the Facility are less than the National and Washington Ambient Air Quality Standards (NAAQS and WAAQS) established to protect human health and welfare. The maximum predicted concentrations attributable to the Facility are added to the existing background concentrations to ensure a conservative analysis.
- Estimated emissions or predicted concentrations of toxic air pollutants released from the Facility are below Ecology’s Small Quantity Emissions Rates (SQER) or Ecology's Acceptable Source Impact Levels (ASIL) for all TAPs, demonstrating that the Facility emissions will be in compliance with Washington’s toxic air pollutant regulations.

5.1.2 Project Emissions

5.1.2.1 Criteria Pollutant Emissions

Criteria pollutants, including oxides of nitrogen (NO_X), sulfur dioxide (SO_2), carbon monoxide (CO), volatile organic compounds (VOCs), and particulate matter (PM)[26], will be emitted by emissions units at the Facility. Facility emission units include natural gas-fired boilers, marine vapor combustion units (MVCUs), and emergency fire-water pumps, as well as fugitive VOC emissions from crude oil storage tanks and piping components. The following sections discuss the development of emission estimates for each of these emission units. Detailed supporting emission calculations are presented in the spreadsheets in Attachment 2.

[26] Virtually all of the particulate matter from the Facility emissions units will be $PM_{2.5}$. For simplicity, this application generally refers to PM but the applicability and compliance will be assessed assuming PM is all PM2.5.

5.1.2.1.1 ~~Natural Gas-Fired Boilers Servicing Area 200 - Unloading Operations~~Area 600 – West Boilers

As described in greater detail in Part 2 of this application, the Facility will receive crude oil from railcars. The oil will be unloaded from the railcars and pumped to storage tanks. Steam provided by natural gas-fired boilers to be located in Area 600~~near~~ will be piped to the railcar unloading area where it will be used on an as needed basis to heat up to 30 railcars at a time, reducing the viscosity of the crude oil sufficiently for the railcar unloading process to be completed within a reasonable time period. Similarly, when necessary, steam will be used to heat up to two of the six crude oil storage tanks to maintain crude oil viscosity such that it can be transferred to marine vessels at the dock.

Three boilers, each with a nameplate heat input capacity of 62 million British thermal units per hour (MMBtu/hr) will be located near the railcar unloading area (these boilers are referred to as the unloading boilers). Typically, no more than two of these boilers will operate at any given time, with the third boiler kept as a redundant unit. To allow for uninterrupted steam supply, the third boiler may start up and begin producing steam for a limited period of time before one of the operating boilers is shut down. For the purposes of evaluating compliance with short-term (1-24 hour) ambient standards and ASILs, all three boilers were assumed operating for 24 continuous hours. For the purposes of evaluating compliance with annual ambient standards and ASILs, two boilers were assumed operating at capacity every hour of the year. This conservative assumption is sufficient to address the occasional startup of the third boiler.

Unloading boiler emission rates were calculated assuming Cleaver Brooks 1500 CBEX Elite natural gas-fired boilers, or equivalent, will be installed and operated. The unloading boilers could operate throughout the year (i.e., 8,760 hours per year), but at varying loads dictated by railcar arrival schedules and the viscosity of the crude oil contained in the railcars. The estimated annual and hourly unloading boiler emission rates and assumptions are presented in Tables 5.1-1 and 5.1-2, respectively.

Table 5.1-1. Area ~~200 Unloading~~ 600 Boilers Maximum Annual Emission Rates[1]

Pollutant	Tons	Basis[2]
NO_X	5.95	Activity: 8,760 hr/yr Emission Factor: 0.011 lb/MMBtu – BACT
CO	19.5	Activity: 8,760 hr/yr Emission Factor: 0.036 lb/MMBtu – BACT
PM	4.06	Activity: 8,760 hr/yr Emission Factor: 0.0075 lb/MMBtu – ~~AP-42, Section 1.4 (Natural Gas Combustion)~~BACT
VOC	2.70	Activity: 8,760 hr/yr Emission Factor: 0.005 lb/MMBtu – BACT
SO_2	1.99	Activity: 8,760 hr/yr Emission Factor: 0.00367 lb/MMBtu – based on annual average gas sulfur content (1.31 gr/100 scf) as determined by testing, plus a 25% safety factor
GHG (CO_2e)	63,284	Activity: 8,760 hr/yr Emission Factor: 117 lb/MMBtu – composite of the CO_2, CH_4, and N_2O emission factors from 40 CFR Part 98 Tables C-1 and C-2, using the GWP factors from Table A-1

Notes:
1) Annual emission rates assuming continuous capacity operation of two boilers.
2) Assumptions in "Basis" column used to calculate the maximum annual emissions.

Table 5.1-2. Area ~~200 Unloading~~ 600 Boiler Hourly Emission Rates[1]

Pollutant	lb	Basis[2]
NO_X	0.68	Emission Factor: 0.011 lb/MMBtu – BACT
CO	2.22	Emission Factor: 0.036 lb/MMBtu – BACT
PM	0.463	Emission Factor: 0.0075 lb/MMBtu – ~~AP-42, Section 1.4 (Natural Gas Combustion)~~BACT
VOC	0.309	Emission Factor: 0.005 lb/MMBtu – BACT
SO_2	0.448	Emission Factor: 0.00725 lb/MMBtu – based on maximum hourly average gas sulfur content (2.59 gr/100 scf) as determined by testing, plus a 25% safety factor

Notes:

1) Hourly average emission rates for a single boiler, based on a maximum firing rate of 62 MMBtu/hr.
2) Assumptions in "Basis" column used to estimate the maximum hourly average emissions.

5.1.2.1.2 Natural Gas-Fired Boilers Servicing Area 300 - Storage

As described in the previous section, crude oil received at the Facility may require heating to be unloaded from the railcars. This crude oil will be transferred from the rail unloading area to two of the six crude oil storage tanks in the storage area, which are insulated and equipped to be steam-heated. The steam used to heat these tanks will be provided by two boilers, each with a nameplate heat input capacity of 12.5 MMBtu/hr that will be located in the storage area (these boilers are referred to as the storage area boilers). Typically, only one of the storage area boilers will operate, with the second kept as a redundant unit. To allow for uninterrupted steam supply, the second boiler may start up and begin producing steam for a limited period of time before the operating boiler is shut down.

For the purposes of evaluating compliance with short-term (1-24 hour) ambient standards and ASILs, both boilers were assumed to be operating at capacity for 24 continuous hours. For the purposes of evaluating compliance with annual ambient standards and ASILs, a single boiler was assumed operating at capacity every hour of the year. This conservative assumption is sufficient to address the occasional startup of the second boiler.

The storage area boiler emission rates were calculated assuming Cleaver Brooks 300 CBEX Elite natural gas-fired boilers, or equivalent, will be installed and operated. A storage area boiler could operate throughout the year (i.e., 8,760 hours per year), but at varying loads dictated by the presence of crude oil in the tanks with heating capability, and the viscosity of the crude oil contained in the tanks. The estimated annual and hourly storage boiler emission rates and assumptions are presented in Tables 5.1-3 and 5.1-4, respectively.

Table 5.1-3. Area 300 Storage Boiler Maximum Annual Emission Rates1

Pollutant	Ton	Basis[2]
NO_X	0.603	Activity: 8,760 hr/yr Emission Factor: 0.011 lb/MMBtu – BACT
CO	1.97	Activity: 8,760 hr/yr Emission Factor: 0.036 lb/MMBtu – BACT
PM	0.411	Activity: 8,760 hr/yr Emission Factor: 0.0075 lb/MMBtu – ~~AP-42, Section 1.4 (Natural Gas Combustion)~~BACT
VOC	0.274	Activity: 8,760 hr/yr Emission Factor: 0.005 lb/MMBtu – BACT
SO_2	0.201	Activity: 8,760 hr/yr Emission Factor: 0.00367 lb/MMBtu – based on annual average gas sulfur content (1.31 gr/100 scf) as determined by testing, plus a 25% safety factor
GHG (CO_2e)	6,415	Activity: 8,760 hr/yr Emission Factor: 117 lb/MMBtu – composite of the CO_2, CH_4, and N_2O emission factors from 40 CFR Part 98 Tables C-1 and C-2, using the GWP factors from Table A-1

Notes:

1) Annual emission rates for one boiler, based on a maximum firing rate of 12.5 MMBtu/hr.
2) Assumptions in "Basis" column used to calculate the maximum annual emissions.

Table 5.1-4. Area 300 Storage Boiler Hourly Emission Rates for A Single Unit

Pollutant	lb	Basis[2]
NO_X	0.138	Emission Factor: 0.011 lb/MMBtu – BACT
CO	0.451	Emission Factor: 0.036 lb/MMBtu – BACT
PM	0.0939	Emission Factor: 0.0075 lb/MMBtu ~~– AP-42, Section 1.4 (Natural Gas Combustion)~~BACT
VOC	0.0626	Emission Factor: 0.005 lb/MMBtu – BACT
SO_2	0.0907	Emission Factor: 0.00725 lb/MMBtu – based on maximum hourly average gas sulfur content (2.59 gr/100 scf) as determined by testing, plus a 25% safety factor

Notes:

1) Hourly average emission rates for a single boiler, based on a maximum firing rate of 12.5 MMBtu/hr.
2) Assumptions in "Basis" column used to estimate the maximum hourly average emissions.

5.1.2.1.3 Marine Vapor Combustion Unit

Crude oil will be transferred from the storage tanks to marine vessels located at the dock at a rate of up to 32,000 barrels per hour (bbl/hr). The daily and annual loading rates will be approximately 47 percent of the maximum hourly loading rate (360,000 bbl/day and 131,400,000 bbl/yr).

Vapors displaced from the tanks on the marine vessels will be collected and routed to a marine vapor combustion unit (MVCU). Emission rates were calculated based on a system consisting of eight Jordan Technologies CEB units. Emissions from the vapors displaced from the tanks were calculated with a net heating value derived using the estimated composition of vapors in the tanks.

Vessels will arrive at the Facility with on-board tanks filled with inert gas with oxygen levels below eight percent. The inert gas consists of cleaned exhaust from dedicated on-board inert gas generators (engines burning ultra-low sulfur distillate). Note that the inert gas is added to the tanks as the cargo is discharged – not at the Facility, which is a loading facility.

When the vessel tanks are filled with crude oil, the vapors from the cargo tanks, made up of hydrocarbon and inert gases, is displaced to the MVCU system, which will combust the hydrocarbons in the vapors. In order to ensure adequate destruction of hydrocarbons by the MVCU, the vapor stream must consist of at least approximately 20 percent hydrocarbon. Based on a theoretical profile of VOC fraction in the displaced vapors as loading progresses (see Attachment 2), the hydrocarbon concentration of the displaced vapors will be less than 20 percent for the first 85 percent of the loading operation, and natural gas will be added if needed to the displaced vapors at the MVCU as an "assist gas" to increase the heating value of the vapors, and ensure adequate destruction. During the final 15 percent of the crude oil loading operation, the hydrocarbon content of the vapors will be greater than 20 percent, and the assist gas will no longer be needed.

The MVCU is expected to achieve a least 99.8 percent destruction of the hydrocarbons in the delivered vapors. The estimated maximum short-term and annual emission rates are summarized in Tables 5.1-5, 5.1-6, and 5.1-7. Table 5.1-5 presents the emissions from combusting displaced vapors in the MVCU, Table 5.1-6 presents the emissions from combusting the assist gas in the MVCU, and Table 5.1-7 presents the sum.

Table 5.1-5. Marine Vapor Combustion Unit Emissions due to Displaced Marine Vessel Vapors

Pollutant	Emission Factor (lb/MMBtu)	Emission Rates[1]		
		(lb/hr)	(lb/day)	(tpy)
NO_X[2]	0.023	5.18	124~~58.3~~	10.6
CO[2]	0.010	2.25	54.1~~25.3~~	4.63
PM[3]	0.0075	1.68	40.5~~18.9~~	3.45
VOC[4]	--	4.21	101.0	8.6
SO_2[5]	--	3.02	72.5~~34.0~~	6.20
GHG (CO_2e)[6]	135.6	~~30,410~~30,500	~~342,100~~733,000	~~62,440~~62,700

Notes:

1) Emission rates are based on the following maximum crude oil loading rates: 32,000 bbl/hr, 360,000 bbl/day, and 131,400,000 bbl/yr (i.e., 360,000 bbl/day * 365 days/yr). The hydrocarbon content of the displaced vapors was assumed to be 10 percent for the first 80 percent of each loading operation, and to average 50 percent over the final 20 percent. An assumed vapor speciation profile was used with these hydrocarbon content profiles to calculate a composite hourly maximum heat input for the displaced vapor (225.3 MMBtu/hr), and a composite daily/annual average heat input (105.6 MMBtu/hr).
2) NO_X, and CO emission factors provided by Jordan Technologies were combined with the composite heat inputs.
3) Calculated using an emission factor from USEPA's AP-42 Section 1.4 (Natural Gas Combustion) and the composite heat inputs.
4) Uncontrolled VOC emissions were calculated using Equation 2 from AP-42 Section 5.2, assuming a worst-case true vapor pressure of 11 psia, a molecular weight of 44.9 lb/lb-mol, and worst-case vessel arrival condition emission factor of 0.86 lb/10^3 gal (from Table 5.2-3, based on the assumption that the previous vessel cargo was volatile, and that the condition of the arriving tanks is "unclean"). The controlled emission rates presented in the table reflect a destruction efficiency of 99.8% applied to the uncontrolled emission rates.
5) SO_2 emissions were based on the assumption that the H_2S content of the vapors displaced from the marine vessel tanks during crude loading operations would not exceed 100 ppm, the Immediately Dangerous to Life or Health (IDLH) concentration established by the National Institute for Occupational Safety and Health (NIOSH). Because each mole of H_2S combusted yields one mole of SO_2, 100 ppm of H_2S will yield 100 ppm of SO_2. The ideal gas law was used to convert this maximum SO_2 concentration, combined with the hourly, daily, and annual maximum volumes of vapor displaced, to mass emission rates.
6) CO2 emission factor provided by Jordan Technologies as a conservative estimate.

Table 5.1-6. Marine Vapor Combustion Unit Emissions due to Assist Gas

Pollutant	Emission Factor (lb/MMBtu)	Emission Rates[1]		
		(lb/hr)	(lb/day)	(tpy)
NO_X[2]	0.023	0.704	14.4	2.62
CO[2]	0.010	0.306	6.24	1.14
PM[3]	0.0075	0.228	4.65	0.849
VOC[4]	--	0	0	0
SO_2[5]	0.00725	0.222	4.52	0.826
GHG (CO_2e)[6]	117	3,580	73,040	13,330

Notes:

1) Emission rates are based on information from Jordan Technologies that assist gas will be added to the displaced vapors from vessel loading at a rate of 30,600 ft^3/hr whenever the hydrocarbon content is less than 20%. The hydrocarbon content of the displaced vapors was assumed to be less than 20 percent for the first 85 percent of each loading operation, and greater than 20% for the remainder. The assist gas will be pipeline natural gas; a gross or higher heating value of 1,000 Btu/ft^3 was assumed. The worst-case hourly assist gas usage rate was assumed to be the maximum assist gas usage rate, 30,600 ft^3/hr. Daily and annual composite usage rates were calculated assuming the maximum assist gas usage rate of 30,600 ft^3/hr 85% of the time, and no added assist gas 15% of the time (i.e., a daily usage rate of 624,240 ft^3/day, and 227,847,600 ft^3/year.
2) NO_X and CO emission factors provided by Jordan Technologies were combined with the usage rates and gross heating value described above.
3) Calculated using an emission factor from USEPA's AP-42 Section 1.4 (Natural Gas Combustion) and the usage rates and gross heating value described above.
4) The assist gas
5) will be pipeline natural gas, which is comprised almost entirely of CH4, which is not a VOC. The small fraction of natural gas that is VOC will be 99.8% combusted by the MVCU; the resulting VOC emissions were assumed to be negligible.
6) SO_2 emissions were based on maximum hourly average gas sulfur content (2.59 gr/100 scf) as determined by testing, plus a 25% safety factor
7) The GHG emission factor in units of CO_2e is a composite of the CO_2, CH_4, and N_2O emission factors from 40 CFR Part 98 Tables C-1 and C-2, using the GWP factors from Table A-1.

Table 5.1-7. Marine Vapor Combustion Unit – Total Emissions

Pollutant	Emission Rates[1]		
	(lb/hr)	(lb/day)	(tpy)
NO_X[1]	5.89	72.6	13.3
CO[1]	2.56	31.6	5.76
PM[2]	1.91	23.5	4.30
VOC[3]	4.21	101.0	8.64
SO_2[4]	3.24	38.5	7.02
GHG (CO_2e)[5]	36,150	439,400	80,190

Notes:

1) Total emission rates are the sum of the displaced vapor emission rates in Table 5.1-5 and the assist gas emission rates in Table 5.1-6. Estimated CO2 emissions from the inerting gas are included in Table 5.1-7.

Table 5.1-6. Marine Vapor Combustion Unit Emissions due to Assist Gas

Pollutant	Emission Factor (lb/MMBtu)	Emission Rates[1]		
		(lb/hr)	(lb/day)	(tons/yr)
NO_X[2]	0.023	0.704	14.4	2.62
CO[2]	0.010	0.306	6.24	1.14
SO_2[3]	0.00725	0.222	4.52	0.826
PM[4]	0.0075	0.230	4.68	0.849
VOC[5]	--	0	0	0
GHG (CO_2e)[6]	117	3,580	73,000	13,300

Notes:

1) Emission rates are based on information from Jordan Technologies that assist gas will be added to the displaced vapors from vessel loading at a rate of 30,600 ft^3/hr whenever the hydrocarbon content is less than 20%. The hydrocarbon content of the displaced vapors was assumed to be less than 20 percent for the first 85 percent of each loading operation, and greater than 20% for the remainder. The assist gas will be pipeline natural gas; a gross or higher heating value of 1,000 Btu/ft^3 was assumed. The worst-case hourly assist gas usage rate was assumed to be the maximum assist gas usage rate, 30,600 ft^3/hr. Daily and annual composite usage rates were calculated assuming the maximum assist gas usage rate of 30,600 ft^3/hr 85% of the time, and no added assist gas 15% of the time (i.e., a daily usage rate of 624,240 ft^3/day, and 227,847,600 ft^3/year).
2) NO_X and CO emission factors provided by Jordan Technologies were combined with the usage rates and gross heating value described above.
3) SO_2 emissions were based on maximum hourly average gas sulfur content (2.59 gr/100 scf) as determined by testing, plus a 25% safety factor
4) Calculated using an emission factor ~~from USEPA's AP-42 Section 1.4 (Natural Gas Combustion)~~provided by Jordan Technologies and the usage rates and gross heating value described above.
5) The assist gas will be pipeline natural gas, which is comprised almost entirely of CH4, which is not a VOC. The small fraction of natural gas that is VOC will be 99.8% combusted by the MVCU; the resulting VOC emissions were assumed to be negligible.
6) The GHG emission factor in units of CO_2e is a composite of the CO_2, CH_4, and N_2O emission factors from 40 CFR Part 98 Tables C-1 and C-2, using the GWP factors from Table A-1.

Table 5.1-7. Marine Vapor Combustion Unit – Total Emissions

Pollutant	Emission Rates[1]		
	(lb/hr)	(lb/day)	(tons/yr)
NO_X	5.89	138.7	13.3
CO	2.56	60.3	5.76
SO_2	3.24	77.0	7.02
PM	1.92	45.2	4.32
VOC	4.21	101.0	8.64
GHG (CO_2e)	36,100	829,000	80,200

Notes:

Total emission rates are the sum of the displaced vapor emission rates in Table 5.1-5 and the assist gas emission rates in Table 5.1-6. Estimated CO2 emissions from the inerting gas are included in Table 5.1-7.

5.1.2.1.4 Crude Oil Storage Tanks

There will be six crude oil storage tanks located in the storage area. Each tank will have a storage capacity of approximately 360,000 bbl, and have a working capacity of approximately 340,000 bbl.[27] Each tank will be approximately 48 feet tall (not counting the peak of the fixed roof), and be approximately 240 feet in diameter. Annual throughput for each of the tanks will be 868,700,000 gallons per year, for a total Facility throughput of 5,212,200,000 gallons per year. Each tank is expected to turn over approximately every six days, when the Facility is operating at full capacity. The tanks will feature an internal floating-roof design, with a pontoon-style internal deck. The edge of the deck will be equipped with a mechanical shoe primary seal, and a rim-mounted secondary seal to minimize the quantity of crude oil on the inside walls when the tank is drawn down.

EPA's TANKS 4.0.9d program was used to calculate fugitive emissions from the crude oil storage tanks. EPA' TANKS 4.0.9d program uses working volume to establish a total throughput for estimating fugitive emissions. Speciation information was developed for a range of crude oils[28], and provided to TANKS for the emission rate calculations that are detailed in Attachment 2. Tank emissions calculated by TANKS are summarized in Table 5.1-8, and the input data and results from TANKS are provided in Attachment 2.

Approximately once every 10 years, tanks will require inspection to ensure adequate operational condition. During this inspection process, a tank is completely drained and degassed. Degassing emission calculations were estimated by combining emissions from two calculations. To account for withdrawal losses while draining and refilling the portion of the tank above the level of the feet on the floating roof, emissions were estimated using EPA TANKS 4.0.9d for an internal floating roof tank (parameters specified in Attachment 2). For the losses associated with draining the tank below the feet that hold up the floating roof, working loss emissions were estimated using EPA TANKS 4.0.9d with a fixed roof with a height equal to the height of the legs (additional parameters specified in Attachment 2). Working and withdrawal loss emissions were then summed in order to determine the total VOC degassing emissions of approximately 1.6 tons.

Table 5.1-8. Total Crude Oil Storage Tank Emission Rates[3]

Pollutant	Hourly Average Emissions (lb/hr)	Annual Emissions (ton/yr)
VOC	5.38[1]	23.58[2]

Notes:
1) Hourly emission rate is the annual emission rate output from tanks divided by 8,760 hours per year.
2) Annual emission rate is a weighted composite of 80% Bakken crude oils and 20% other crude oils. Approximately every ten years, the annual emissions will be approximately 1.6 tons higher due to tank inspection and maintenance.
3) Emissions are a combined total from all six tanks.

There will be six additional tanks at the Facility not intended to store crude oil. It is occasionally necessary to clean railcars that enter the Facility with dried crude oil from the loading process.

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[27] Although the tanks could hold approximately 360,000 bbl, in actual operation internal floating roof tanks are never completely full. The working capacity of the tanks is slightly lower than the total capacity to reflect the maximum volume that each tank will actually hold during operation.

[28] Six crude oils with Reid Vapor Pressures (RVPs) ranging from 0.98 to 8.41, as well as four Bakken crudes (413, 413-light, 423, and 430).

This cleaning process uses a large quantity of soapy water to scrub dried crude oil from the shell of the railcar. There are six containment tanks located within the railcar unloading area that could be used to collect wash water from railcar cleaning. In addition to collecting wash water, these tanks could be used to store spilled material. The containment tanks are fixed roof tanks with an estimated height of 24 feet and a 12-foot diameter. It is expected that the throughput for these tanks will result in roughly one tank turnover per week. The liquid itself will be almost entirely soapy water, with only a very small portion of crude oil present in the mixture. Because of this relatively small throughput and small fraction of crude oil present in the mixture, emissions from these containment tanks are considered to be negligible.

5.1.2.1.5 Emergency Diesel Fire Water Pump Engines

Emergency fire water pumps powered by diesel engines will be used in the event that water is needed to fight a fire within the Facility. Each of the engines will be 225 horsepower (hp) or smaller, and, while specific makes and models have not been selected, emission rates were calculated using emission factors for a 225 hp fire water pump engine that is representative of the units that will be installed. All three engines will be fueled with ultra-low sulfur diesel (ULSD). Planned operation of the units will be limited to half an hour a week for readiness testing and one 8-hour test per year, as specified by the National Fire Protection Association's NFPA 25. Calculated emission rates from these engines are summarized in Table 5.1-9.

Table 5.1-9. Emergency Diesel Fire Water Pump Emission Rates

Pollutant	Emission Factor[1] (g/kW-hr)	Emission Rate[4] (lb/hr)	(lb/day)	(ton/yr)
NO_X	0.34	0.124	0.124	0.00211
CO	1.60	0.592	0.592	0.0101
SO_2	--[2]	~~0.194~~0.0025	~~0.194~~0.0025	~~0.00329~~0.00004
PM	0.17	0.0629~~3~~	0.0629~~3~~	0.00107
VOC	0.37	0.137	0.137	0.00233
GHG (CO_2e)	717[3]	265	265	4.5

Notes:

1) Provided by manufacturer/data.
2) Based on use of ULSD (15 ppm sulfur by weight).
3) From 40 CFR Part 98 Subpart C.
4) Emissions are for a single diesel fire water pump engine, operated for a maximum of 1 hour per day and 34 hours per year.

5.1.2.1.6 Fugitive Component Leaks

VOC emissions associated with minute vapor leakage from valve seals, pump seals, pressure relief valves, flanges, and similar equipment were calculated using anticipated component counts and USEPA fugitive emissions factors. Fugitive emission factors were obtained from Protocol for Equipment Leak Estimates, USEPA 453-R95-017, November 1995. Fugitive VOC emissions associated with leaks from gaseous and liquid streams are presented in Table 5.1-10. Calculation details are provided in Attachment 2.

Table 5.1-10. Short-term and Annual VOC Emissions from the Fugitive Equipment Leaks

Pollutant	Hourly Average Emissions[1] (lb/hr)	Annual Emissions[2] (ton/yr)
VOC	0.19	0.82

Notes:
1) Hourly emission is the worst-case crude emission rate divided by 8,760 hours per year.

5.1.2.1.7 Locomotive and Marine Vessel Emissions

Crude oil will be delivered to the Facility by rail for transport by marine vessel. Emissions from locomotives and vessels are not included in the Facility emissions inventory or dispersion modeling because they are mobile sources powered by off-road engines, and these sources of emissions are specifically exempted from pre-construction permitting.[29]

5.1.2.1.8 Facility-wide Emissions Summary

Table 5.1-11, 5.1-12, and 5.1-13 summarize the maximum estimated hourly, daily and annual criteria pollutant and GHG emissions from all Facility emissions units.

Table 5.1-11. Hourly Emissions

- ~~Pollutant~~	~~Emission Rate (lb)~~						
	~~Storage Area Boiler~~	~~Unload Boiler~~	~~MVCU~~	~~Components~~	~~Tanks~~	~~Firewater Pump~~	~~Total~~
~~NO_X~~	~~0.28~~	~~2.04~~	~~5.89~~	~~--~~	~~--~~	~~0.37~~	~~8.57~~
~~CO~~	~~0.90~~	~~6.67~~	~~2.56~~	~~--~~	~~--~~	~~1.78~~	~~11.90~~
~~SO_2~~	~~0.18~~	~~1.34~~	~~3.24~~	~~--~~	~~--~~	~~0.58~~	~~5.35~~
~~PM~~	~~0.19~~	~~1.39~~	~~1.91~~	~~--~~	~~--~~	~~0.19~~	~~3.67~~
~~VOC~~	~~0.13~~	~~0.93~~	~~4.21~~	~~0.19~~	~~5.38~~	~~0.41~~	~~11.24~~
~~CO_2e~~	~~2,929~~	~~21,672~~	~~36,146~~	~~3~~	~~60~~	~~796~~	~~61,606~~

- Pollutant	Emission Rate (lb/hr)						
	Area 300 Boilers	Area 600 Boilers	MVCU	Component Leaks	Tanks	Firewater Pumps	Total
NO_X	0.275	2.04	5.89	--	--	0.372	8.57
CO	0.901	6.67	2.56	--	--	1.78	11.9
SO_2	0.181	1.34	3.24	--	--	0.00762	5.35
PM	0.188	1.39	1.92	--	--	0.189	3.67
VOC	0.125	0.926	4.21	0.188	5.38	0.411	11.2
GHG (CO_2e)	2,930	21,700	36,100	2.72	59.5	796	61,600

[29] See, e.g., WAC 173-400-030(79) ("Secondary emissions do not include any emissions which come directly from a mobile source such as emissions from the tailpipe of a motor vehicle, from a train, or from a vessel."); In re Cardinal FG Company, EPA Environmental Appeals Board PSD Appeal 04-04 (2005) (holding that Ecology correctly concluded that emissions from a captive on-site locomotive are not attributable to the stationary source); Letter from EPA to Ken Waid (Jan. 8, 1990) stating that "to and fro" vessel emissions are not attributable to a stationary source and that when determining PSD applicability you do not consider those emissions "which result from activities which do not directly serve the purposes of the terminal and are not under the control of the terminal owner or operator.")

Table 5.1-12. Daily Emissions

~~Pollutant~~	~~Emission Rate (lb)~~						
	~~Storage Area Boiler~~	~~Unload Boiler~~	~~MVCU~~	~~Components~~	~~Tanks~~	~~Firewater Pump~~	~~Total~~
~~NO_X~~	~~6.61~~	~~48.90~~	~~72.65~~	~~--~~	~~--~~	~~0.37~~	~~128.53~~
~~CO~~	~~21.63~~	~~160.04~~	~~31.59~~	~~--~~	~~--~~	~~1.78~~	~~215.04~~
~~SO_2~~	~~4.36~~	~~32.22~~	~~38.49~~	~~--~~	~~--~~	~~0.58~~	~~75.65~~
~~PM~~	~~4.51~~	~~33.34~~	~~23.53~~	~~--~~	~~--~~	~~0.19~~	~~61.57~~
~~VOC~~	~~3.00~~	~~22.23~~	~~100.98~~	~~4.50~~	~~129.19~~	~~0.41~~	~~260.32~~
~~CO_2e~~	~~70,307~~	~~520,140~~	~~439,403~~	~~65~~	~~1,428~~	~~796~~	~~1,032,139~~

Pollutant	Emission Rate (lb/day)						
	Area 300 Boilers	Area 600 Boilers	MVCU	Component Leaks	Tanks	Firewater Pumps	Total
NO_X	6.61	48.9	139	--	--	0.372	195
CO	21.6	160	60.3	--	--	1.78	244
SO_2	4.36	32.2	77.0	--	--	0.00762	114
PM	4.51	33.3	45.2	--	--	0.189	83.3
VOC	3.00	22.2	101	4.50	129	0.411	260
GHG (CO_2e)	70,300	520,000	829,000	65.2	1,430	796	1,420,000

Table 5.1-13. Annual Emissions

~~Pollutant~~	~~Emission Rate (tons)~~						
	~~Storage Area Boilers~~	~~Unload Boiler~~	~~MVCU~~	~~Components~~	~~Tanks~~	~~Firewater Pumps~~	~~Total~~
~~NO_X~~	~~0.60~~	~~5.95~~	~~13.26~~	~~--~~	~~--~~	~~0.01~~	~~19.82~~
~~CO~~	~~1.97~~	~~19.47~~	~~5.76~~	~~--~~	~~--~~	~~0.03~~	~~27.24~~
~~SO_2~~	~~0.20~~	~~1.99~~	~~7.02~~	~~--~~	~~--~~	~~0.01~~	~~9.22~~
~~PM~~	~~0.41~~	~~4.06~~	~~4.30~~	~~--~~	~~--~~	~~0.00~~	~~8.77~~
~~VOC~~	~~0.27~~	~~2.70~~	~~8.64~~	~~0.82~~	~~23.58~~	~~0.01~~	~~36.02~~
~~CO_2e~~	~~6,415~~	~~63,284~~	~~80,191~~	~~12~~	~~261~~	~~14~~	~~150,176~~

Pollutant	Emission Rate (tons/yr)						
	Area 300 Boilers	Area 600 Boilers	MVCU	Component Leaks	Tanks	Firewater Pumps	Total
NO_X	0.603	5.95	13.3	--	--	0.00632	19.8
CO	1.97	19.5	5.76	--	--	0.0302	27.2
SO_2	0.201	1.99	7.02	--	--	0.000130	9.22
PM	0.411	4.06	4.32	--	--	0.00321	8.79
VOC	0.274	2.70	8.64	0.822	23.6	0.00689	36.0
GHG (CO_2e)	6,420	63,300	80,200	11.9	261	13.5	150,000

5.1.2.2 Toxic Air Pollutants

The Facility has the potential to emit non-criteria air pollutants that are regulated federally by the CAA Section 112 and others regulated in Washington by Ecology and EFSEC under Chapter 173-460 WAC. Some of these pollutants are deemed “hazardous air pollutants” (HAPs) under the CAA Section 112; others are defined as “toxic air pollutants” (TAPs) under Chapter 173-460 WAC.

Table 5.1-14 compares calculated facility-wide TAP emissions with Washington’s Small Quantity Emission Rates (SQERs). If facility-wide emissions of a given pollutant are greater than its SQER, dispersion modeling is required to determine compliance with ambient air quality criteria (Acceptable Source Impact Levels, or ASILs). As shown in Table 5.1-14, eight TAPs exceed the applicable SQERs; compliance with the applicable ASILs will be assessed in Section 5.1.4.

Table 5.1.14 also identifies which of the TAPs is a federal HAP. The HAP emitted in greatest quantity from the Facility is hexane (2.22 tons per year). Aggregate HAP emissions are 2.5 tons per year.

The following sections discuss the estimation of TAP/HAP emissions from each emission unit. Detailed emission calculations are presented in Attachment 2.

Table 5.1-14. Facility-wide Toxic Air Pollutant Emissions

Compound	CAS	HAP?	WA TAP Averaging Period	Emission Rate	SQER	Model?
				lb/avg per	lb/avg per	
Acetaldehyde	75-07-0	Yes	Annual	4.23E-02	71	No
Acrolein	107-02-8	Yes	24-Hour	1.50E-04	0.00789	No
Arsenic	7440-38-2	Yes	Annual	4.31E-01	0.0581	Yes
Benzene	71-43-2	Yes	Annual	1.06E+02	6.62	Yes
Benzo(a)anthracene	56-55-3	No	Annual	3.98E-03	1.74	No
Benzo(a)pyrene	50-32-8	No	Annual	2.60E-03	0.174	No
Benzo(b)fluoranthene	205-99-2	No	Annual	3.89E-03	1.74	No
Benzo(k)fluoranthene	207-08-9	No	Annual	3.89E-03	1.74	No
Beryllium	7440-41-7	Yes	Annual	2.59E-02	0.08	No
1,3-Butadiene	106-99-0	Yes	Annual	2.16E-03	1.13	No
Cadmium	7440-43-9	Yes	Annual	2.37E+00	0.0457	Yes
Carbon monoxide	630-08-0	No	1-Hour	1.19E+01~~9.23E+00~~	50.4	No
Chromium, (hexavalent)	18540-29-9	No	Annual	1.21E-01	0.00128	Yes
Chrysene	218-01-9	No	Annual	3.90E-03	17.4	No
Cobalt	7440-48-4	Yes	24-Hour	8.39E-04~~4.96E-04~~	0.013	No
Copper	7440-50-8	No	1-Hour	3.57E-04~~2.94E-04~~	0.219	No
Cyclohexane	110-82-7	No	24-Hour	5.10E-01~~1.05E-01~~	789	No
Dibenzo(a,h)anthracene	53-70-3	No	Annual	2.62E-03	0.16	No
Diesel Engine Particulate	DEP	No	Annual	6.41E+00	0.639	Yes
7,12-Dimethylbenz(a)anthracene	57-97-6	No	Annual	3.45E-02	0.00271	Yes
Ethylbenzene	100-41-4	Yes	Annual	4.53E+01	76.8	No
Fluorene	86-73-7	No	24-Hour	4.73E-05	1.71	No
Formaldehyde	50-00-0	Yes	Annual	2.43E+01	32	No
Hexane	110-54-3	Yes	24-Hour	1.97E+01~~1.10E+01~~	92	No
Hydrogen Sulfide	7783-06-4	No	24-Hour	9.45E-03	0.263	No
Indeno(1,2,3-cd)pyrene	193-39-5	No	Annual	3.90E-03	1.74	No
Isopropyl benzene	98-82-8	Yes	24-Hour	1.58E-02~~3.38E-03~~	52.6	No
Manganese	7439-96-5	Yes	24-Hour	3.79E-03~~2.25E-03~~	0.00526	No
Mercury	7439-97-6	Yes	24-Hour	2.60E-03~~1.54E-03~~	0.0118	No
3-Methylchloranthrene	56-49-5	No	Annual	3.88E-03	0.0305	No
Naphthalene	91-20-3	Yes	Annual	1.32E+00	5.64	No
Nitrogen dioxide	10102-44-0	No	1-Hour	8.57E+00~~7.75E+00~~	1.03	Yes
Propylene	115-07-1	No	24-Hour	4.18E-04	394	No
Selenium	7782-49-2	Yes	24-Hour	2.40E-04~~1.42E-04~~	2.63	No
Sulfur dioxide	7446-09-5	No	1-Hour	4.77E+00~~4.81E+00~~	1.45	Yes
Toluene	108-88-3	Yes	24-Hour	430E-01~~1.03E-01~~	657	No
Vanadium	7440-62-2	No	24-Hour	2.30E-02~~1.36E-02~~	0.0263	No
Xylene (-m)	108-38-3	Yes	24-Hour	4.19E-01~~8.85E-02~~	29	No
Xylene (-o)	95-47-6	Yes	24-Hour	1.10E-01~~2.27E-02~~	29	No
Xylene (-p)	106-42-3	Yes	24-Hour	1.22E-01~~2.53E-02~~	29	No

5.1.2.2.1 Natural Gas-Fired Boilers

Emissions of TAPs from the natural gas-fired ~~unloading~~ Area 600 and ~~storage area~~ Area 300 boilers were calculated using emission factors from USEPA's AP-42 Section 1.4 (Natural Gas Combustion). TAP emission rates for compounds that are also criteria pollutants (i.e., CO, NO_2, SO_2) were calculated using the same emission factors used to calculate criteria pollutant emission rates. Table 5.1-15 presents short term TAP emissions from three ~~unloading~~ Area 600 boilers operating at full load and annual TAP emissions from two ~~unloading~~ Area 600 boilers operating at full load. Table 5.1-16 presents short term TAP emissions from two ~~storage area~~ Area 300 boilers operating at full load and annual TAP emissions from one ~~storage area~~ Area 300 boiler operating at full load.

Table 5.1-15. ~~Unloading~~ Area 600 Boilers ~~Tap~~ TAP Emissions

Compound	CAS #	Emission Factor ($lb/10^6$ scf)	Emission Rate[1]		
			(lb/hr)	(lb/day)	(lb/yr)
Arsenic	7440-38-2	0.0002	3.70E-05	8.89E-04	2.16E-01
Benzene	71-43-2	0.0021	3.89E-04	9.34E-03	2.27E+00
Benzo(a)anthracene	56-55-3	0.0000018	3.33E-07	8.00E-06	1.95E-03
Benzo(a)pyrene	50-32-8	0.0000012	2.22E-07	5.33E-06	1.30E-03
Benzo(b)fluoranthene	205-99-2	0.0000018	3.33E-07	8.00E-06	1.95E-03
Benzo(k)fluoranthene	207-08-9	0.0000018	3.33E-07	8.00E-06	1.95E-03
Beryllium	7440-41-7	0.000012	2.22E-06	5.33E-05	1.30E-02
Cadmium	7440-43-9	0.0011	2.04E-04	4.89E-03	1.19E+00
Carbon monoxide	630-08-0	0.036	6.67E+00	1.60E+02	3.89E+04
Chromium, (hexavalent)[2]	18540-29-9	0.000056	1.04E-05	2.49E-04	6.06E-02
Chrysene	218-01-9	0.0000018	3.33E-07	8.00E-06	1.95E-03
Cobalt	7440-48-4	0.000084	1.56E-05	3.73E-04	9.09E-02
Copper	7440-50-8	0.00085	1.57E-04	3.78E-03	9.20E-01
Dibenzo(a,h)anthracene	53-70-3	0.0000012	2.22E-07	5.33E-06	1.30E-03
7,12-Dimethylbenz(a)anthracene	57-97-6	0.000016	2.96E-06	7.11E-05	1.73E-02
Formaldehyde	50-00-0	0.01125	2.08E-03	5.00E-02	1.22E+01
Hexane	110-54-3	1.8	3.33E-01	8.00E+00	1.95E+03
Indeno(1,2,3-cd)pyrene	193-39-5	0.0000018	3.33E-07	8.00E-06	1.95E-03
Manganese	7439-96-5	0.00038	7.04E-05	1.69E-03	4.11E-01
Mercury	7439-97-6	0.00026	4.82E-05	1.16E-03	2.81E-01
3-Methylchloranthrene	56-49-5	0.0000018	3.33E-07	8.00E-06	1.95E-03
Naphthalene	91-20-3	0.00061	1.13E-04	2.71E-03	6.60E-01
Nitrogen dioxide	10102-44-0	0.011	2.04E+00	4.89E+01	1.19E+04
Selenium	7782-49-2	0.000024	4.45E-06	1.07E-04	2.60E-02
Sulfur dioxide	7446-09-5	0.00725	1.34E+00	3.22E+01	3.97E+03
Toluene	108-88-3	0.0034	6.30E-04	1.51E-02	3.68E+00
Vanadium	7440-62-2	0.0023	4.26E-04	1.02E-02	2.49E+00

Notes:

1) Short term emissions from three in-service boilers combined, annual emissions from two in-service boilers combined, each with a maximum heat input rate of 62 MMBtu/hr

2) Note: AP-42 provides a chromium emission factor for natural gas fired external combustion, but does not include guidance for partitioning emissions between the carcinogenic chromium VI (hexavalent chromium) and the chromium III (trivalent chromium). EPA's 2002 National-Scale Air Toxics Assessment (NATA) released June 2009 includes a chromium speciation profile for gas-fired process heaters, which indicates 4 percent of total chromium is chromium VI and 96 percent is chromium III. ENVIRON assumed 4 percent of total chromium emissions were emitted as chromium VI.

Table 5.1-16. ~~Storage~~ Area 300 Boiler ~~Tap~~ TAP Emissions

Compound	CAS #	Emission Factor (lb/10^6 scf)	Emission Rate		
			(lb/hr)	(lb/day)	(lb/yr)
Arsenic	7440-38-2	0.0002	5.01E-06	1.20E-04	2.19E-02
Benzene	71-43-2	0.0021	5.26E-05	1.26E-03	2.30E-01
Benzo(a)anthracene	56-55-3	0.0000018	4.51E-08	1.08E-06	1.97E-04
Benzo(a)pyrene	50-32-8	0.0000012	3.00E-08	7.21E-07	1.32E-04
Benzo(b)fluoranthene	205-99-2	0.0000018	4.51E-08	1.08E-06	1.97E-04
Benzo(k)fluoranthene	207-08-9	0.0000018	4.51E-08	1.08E-06	1.97E-04
Beryllium	7440-41-7	0.000012	3.00E-07	7.21E-06	1.32E-03
Cadmium	7440-43-9	0.0011	2.75E-05	6.61E-04	1.21E-01
Carbon monoxide	630-08-0	0.036	9.01E-01	2.16E+01	3.95E+03
Chromium, (hexavalent)[2]	18540-29-9	0.000056	1.40E-06	3.37E-05	6.14E-03
Chrysene	218-01-9	0.0000018	4.51E-08	1.08E-06	1.97E-04
Cobalt	7440-48-4	0.000084	2.10E-06	5.05E-05	9.21E-03
Copper	7440-50-8	0.00085	2.13E-05	5.11E-04	9.32E-02
Dibenzo(a,h)anthracene	53-70-3	0.0000012	3.00E-08	7.21E-07	1.32E-04
7,12-Dimethylbenz(a)anthracene	57-97-6	0.000016	4.01E-07	9.61E-06	1.75E-03
Formaldehyde	50-00-0	0.01125	2.82E-04	6.76E-03	1.23E+00
Hexane	110-54-3	1.8	4.51E-02	1.08E+00	1.97E+02
Indeno(1,2,3-cd)pyrene	193-39-5	0.0000018	4.51E-08	1.08E-06	1.97E-04
Manganese	7439-96-5	0.00038	9.51E-06	2.28E-04	4.17E-02
Mercury	7439-97-6	0.00026	6.51E-06	1.56E-04	2.85E-02
3-Methylchloranthrene	56-49-5	0.0000018	4.51E-08	1.08E-06	1.97E-04
Naphthalene	91-20-3	0.00061	1.53E-05	3.67E-04	6.69E-02
Nitrogen dioxide	10102-44-0	0.011	2.75E-01	6.61E+00	1.21E+03
Selenium	7782-49-2	0.000024	6.01E-07	1.44E-05	2.63E-03
Sulfur dioxide	7446-09-5	0.00725	1.81E-01	4.36E+00	4.03E+02
Toluene	108-88-3	0.0034	8.51E-05	2.04E-03	3.73E-01
Vanadium	7440-62-2	0.0023	5.76E-05	1.38E-03	2.52E-01

Notes:

1) Short term emission rates are for two in-service boilers combined, annual emission rates are for one in-service boiler, each with a maximum heat input rate of 12.5 MMBtu/hr.
2) AP-42 provides a chromium emission factor for natural gas fired external combustion, but does not include guidance for partitioning emissions between the carcinogenic chromium VI (hexavalent chromium) and the chromium III (trivalent chromium). EPA's 2002 National-Scale Air Toxics Assessment (NATA) released June 2009 includes a chromium speciation profile for gas-fired process heaters, which indicates 4 percent of total chromium is chromium VI and 96 percent is chromium III. ENVIRON assumed 4 percent of total chromium emissions were emitted as chromium VI.

5.1.2.2.2 Marine Vapor Combustion Unit

Emissions of TAPs from the marine vapor combustion unit (MVCU) were calculated using emission factors from USEPA's AP-42 Section 1.4 (Natural Gas Combustion) for both the vapor displaced from the marine vessels and the assist gas. TAP emissions for compounds that are also criteria pollutants (i.e., CO, NO_2, SO_2) were calculated using the same emission factors or assumptions and methodology used to calculate criteria pollutant emission rates. Table 5.1-17 presents aggregate TAP emissions from the proposed marine vapor combustion unit.

Table 5.1-17. Marine Vapor Combustion Unit ~~Tap~~ TAP Emissions

Compound	CAS #	Emission Factor (lb/10^6 scf)	Emission Rate[1]		
			(lb/hr)	(lb/day)	(lb/yr)
Arsenic	7440-38-2	0.0002	4.21E-05	9.87E-04~~5.29E-04~~	1.93E-01
Benzene	71-43-2	0.0021	4.42E-04	1.04E-02~~5.56E-03~~	2.03E+00
Benzo(a)anthracene	56-55-3	0.0000018	3.78E-07	8.89E-06~~4.76E-06~~	1.74E-03
Benzo(a)pyrene	50-32-8	0.0000012	2.52E-07	5.92E-06~~3.17E-06~~	1.16E-03
Benzo(b)fluoranthene	205-99-2	0.0000018	3.78E-07	8.89E-06~~4.76E-06~~	1.74E-03
Benzo(k)fluoranthene	207-08-9	0.0000018	3.78E-07	8.89E-06~~4.76E-06~~	1.74E-03
Beryllium	7440-41-7	0.000012	2.52E-06	5.92E-05~~3.17E-05~~	1.16E-02
Cadmium	7440-43-9	0.0011	2.31E-04	5.43E-03~~2.91E-03~~	1.06E+00
Carbon monoxide	630-08-0	--[2]	2.56E+00	6.03E+01~~3.16E+01~~	1.15E+04~~5.76E+00~~
Chromium, (hexavalent)[3]	18540-29-9	0.000056	1.18E-05	2.76E-04~~1.48E-04~~	5.41E-02
Chrysene	218-01-9	0.0000018	3.78E-07	8.89E-06~~4.76E-06~~	1.74E-03
Cobalt	7440-48-4	0.000084	1.77E-05	4.15E-04~~2.22E-04~~	8.11E-02
Copper	7440-50-8	0.00085	1.79E-04	4.20E-03~~2.25E-03~~	8.21E-01
Dibenzo(a,h)anthracene	53-70-3	0.0000012	2.52E-07	5.92E-06~~3.17E-06~~	1.16E-03
7,12-Dimethylbenz(a)anthracene	57-97-6	0.000016	3.36E-06	7.90E-05~~4.23E-05~~	1.54E-02
Formaldehyde	50-00-0	0.01125	2.37E-03	5.55E-02~~2.98E-02~~	1.09E+01
Hexane	110-54-3	1.8	3.78E-01	8.89E+00~~4.76E+00~~	1.74E+03
Indeno(1,2,3-cd)pyrene	193-39-5	0.0000018	3.78E-07	8.89E-06~~4.76E-06~~	1.74E-03
Manganese	7439-96-5	0.00038	7.99E-05	1.88E-03~~1.01E-03~~	3.67E-01
Mercury	7439-97-6	0.00026	5.47E-05	1.28E-03~~6.88E-04~~	2.51E-01
3-Methylchloranthrene	56-49-5	0.0000018	3.78E-07	8.89E-06~~4.76E-06~~	1.74E-03
Naphthalene	91-20-3	0.00061	1.28E-04	3.01E-03~~1.61E-03~~	5.89E-01
Nitrogen dioxide	10102-44-0	--[2]	5.89E+00	1.39E+02~~7.26E+01~~	2.65E+04~~1.33E+0~~1
Selenium	7782-49-2	0.000024	5.05E-06	1.18E-04~~6.35E-05~~	2.32E-02
Sulfur dioxide	7446-09-5	--[2]	3.24E+00	7.70E+01~~3.85E+01~~	1.40E+04~~7.02E+00~~
Toluene	108-88-3	0.0034	7.15E-04	1.68E-02~~8.99E-03~~	3.28E+00
Vanadium	7440-62-2	0.0023	4.84E-04	1.14E-02~~6.08E-03~~	2.22E+00

Notes:

1) Displaced vapor volumes calculated for maximum hourly, daily, and annual averaging periods were combined with the natural gas-fired emission factors to calculate TAP emission rates; considering that, even for the worst-case hourly average scenario, which is when vessel loading is almost complete, the displaced vapor will not be 100% percent saturated by hydrocarbons. The maximum hourly assist gas flow rate (30,600 ft^3/hr) was used to calculate emission rates for TAPs that have a SQER with a 1-hour average basis. For TAPs that have a SQER with a 24-hour or annual average basis, 85% of the maximum assist gas flow rate was used.

2) The maximum hourly emission rate calculated for the criteria pollutant analysis was used. See Tables 5.1-5, 5.1-6, and 5.1-7.
3) AP-42 provides a chromium emission factor for natural gas fired external combustion, but does not include guidance for partitioning emissions between the carcinogenic chromium VI (hexavalent chromium) and the chromium III (trivalent chromium). EPA's 2002 National-Scale Air Toxics Assessment (NATA) released June 2009 includes a chromium speciation profile for gas-fired process heaters, which indicates 4 percent of total chromium is chromium VI and 96 percent is chromium III. ENVIRON assumed 4 percent of total chromium emissions were emitted as chromium VI.

5.1.2.2.3 Crude Oil Storage Tanks

Emissions of TAPs from the crude oil storage tanks were calculated using the same methodology as the criteria pollutants. The TANKS program calculated emission rates for each of the TAPs included in the provided speciation information. Table 5.1-18 presents the estimated aggregate TAP emissions from the crude oil storage tanks.

Table 5.1-18. Crude Oil Storage Tank ~~Tap~~ TAP Emissions

Components	CAS #	Emission Rate		
		(lb/hr)	(lb/day)	(lb/yr)
Benzene	71-43-2	1.10E-02~~1.83E-03~~	2.64E-01~~4.40E-02~~	9.63E+01
Cyclohexane	110-82-7	2.03E-02~~3.38E-03~~	4.86E-01~~8.10E-02~~	1.77E+02
Cyclopentane	287-92-3	1.13E-02~~1.88E-03~~	2.70E-01~~4.50E-02~~	9.86E+01
Ethylbenzene	100-41-4	4.89E-03~~8.16E-04~~	1.17E-01~~1.96E-02~~	4.29E+01
Hexane	110-54-3	6.84E-02~~1.14E-02~~	1.64E+00~~2.74E-01~~	5.99E+02
Hydrogen Sulfide	7783-06-4	3.66E-04~~3.66E-04~~	8.78E-03~~8.78E-03~~	3.21E+00
Isooctane	540-84-1	6.15E-04~~1.03E-04~~	1.48E-02~~2.46E-03~~	5.39E+00
Isopentane	78-78-4	1.14E-01~~1.90E-02~~	2.74E+00~~4.56E-01~~	9.99E+02
Isopropyl benzene	98-82-8	6.21E-04~~1.03E-04~~	1.49E-02~~2.48E-03~~	5.44E+00
Pentane	109-66-0	1.52E-01~~2.54E-02~~	3.65E+00~~6.08E-01~~	1.33E+03
Toluene	108-88-3	1.56E-02~~2.60E-03~~	3.75E-01~~6.25E-02~~	1.37E+02
1,2,4-Trimethylbenzene	95-63-6	2.04E-03~~3.40E-04~~	4.89E-02~~8.15E-03~~	1.79E+01
Xylene (-m)	108-38-3	1.65E-02~~2.75E-03~~	3.96E-01~~6.60E-02~~	1.45E+02
Xylene (-o)	95-47-6	4.35E-03~~7.25E-04~~	1.04E-01~~1.74E-02~~	3.81E+01
Xylene (-p)	106-42-3	4.85E-03~~8.09E-04~~	1.17E-01~~1.94E-02~~	4.25E+01

Notes:
1) Annual emission rate is a weighted composite of 80% worst-case Bakken crude result from tanks, and 20% worst-case other crude.

5.1.2.2.4 Emergency Diesel Fire Water Pump Engines

Emissions of TAPs from the emergency fire water pump engines were calculated based on USEPA AP-42 emission factors for small internal combustion diesel engines (Section 3.3). Annual emissions were based on 34 hours of operation for maintenance and testing purposes only. TAP emissions for compounds that are also criteria pollutants were calculated using the same emission factors or assumptions and methodology used to calculate criteria pollutant emission rates. Table 5.1-19 presents the estimated aggregate TAP emissions from the emergency fire water pump engines.

Table 5.1-19. Emergency Fire Water Pump Engine ~~Tap~~ TAP Emissions

CAS #	Compound	Emission Factor ($lb/10^6$ Btu)	Emission Rate[1]		
			(lb/hr)	(lb/day)	(lb/yr)
83-32-9	Acenaphthene	1.42E-06	2.30E-06	2.30E-06	7.83E-05
208-96-8	Acenaphthylene	5.06E-06	8.20E-06	8.20E-06	2.79E-04
75-07-0	Acetaldehyde	7.67E-04	1.24E-03	1.24E-03	4.23E-02
107-02-8	Acrolein	9.25E-05	1.50E-04	1.50E-04	5.10E-03
120-12-7	Anthracene	1.87E-06	3.03E-06	3.03E-06	1.03E-04
71-43-2	Benzene	9.33E-04	1.51E-03	1.51E-03	5.14E-02
56-55-3	Benzo(a)anthracene	1.68E-06	2.72E-06	2.72E-06	9.26E-05
50-32-8	Benzo(a)pyrene	1.88E-07	3.05E-07	3.05E-07	1.04E-05
205-99-2	Benzo(b)fluoranthene	9.91E-08	1.61E-07	1.61E-07	5.46E-06
191-24-2	Benzo(g,h,i)perylene	4.89E-07	7.93E-07	7.93E-07	2.70E-05
207-08-9	Benzo(k)fluoranthene	1.55E-07	2.51E-07	2.51E-07	8.54E-06
106-99-0	1,3-Butadiene	3.91E-05	6.34E-05	6.34E-05	2.16E-03
630-08-0	Carbon monoxide	--[2]	1.78E+00	1.78E+00	6.04E+01
218-01-9	Chrysene	3.53E-07	5.72E-07	5.72E-07	1.95E-05
53-70-3	Dibenz(a,h)anthracene	5.83E-07	9.45E-07	9.45E-07	3.21E-05
none	Diesel Engine Particulate	--[2]	1.89E-01	1.89E-01	6.41E+00
206-44-0	Fluoranthene	7.61E-06	1.23E-05	1.23E-05	4.20E-04
86-73-7	Fluorene	2.92E-05	4.73E-05	4.73E-05	1.61E-03
50-00-0	Formaldehyde	1.18E-03	1.91E-03	1.91E-03	6.51E-02
193-39-5	Indeno(1,2,3-cd)pyrene	3.75E-07	6.08E-07	6.08E-07	2.07E-05
91-20-3	Naphthalene	8.48E-05	1.37E-04	1.37E-04	4.67E-03
10102-44-0	Nitrogen dioxide	--[2]	3.72E-01	3.72E-01	1.26E+01
85-01-8	Phenanthrene	2.94E-05	4.77E-05	4.77E-05	1.62E-03
115-07-1	Propylene	2.58E-04	4.18E-04	4.18E-04	1.42E-02
129-00-0	Pyrene	4.78E-06	7.75E-06	7.75E-06	2.64E-04
7446-09-5	Sulfur dioxide	--[2]	~~5.81E-01~~7.62E-03	~~5.81E-01~~7.62E-03	~~1.97E+01~~2.59E-01
108-88-3	Toluene	4.09E-04	6.63E-04	6.63E-04	2.25E-02
108-38-3	Xylenes (m-xylene)[3]	2.85E-04	4.62E-04	4.62E-04	1.57E-02

Notes:

1) Hourly emission rates are based on maximum operation, daily emission rates are based on one hour of operation per day, and annual emission rates are based on 34 hours of operation per year.
2) The emission rates calculated for the criteria pollutant analysis were used. See Table 5.1-9.

5.1.2.2.5 Fugitive Component Leaks

TAP emissions associated with normal equipment leakage at the Facility have been estimated using USEPA fugitive emission factors for valve seals, pump seals, pressure relief valves, flanges, and similar equipment.[30] Emission estimates are based on equipment counts, which are, in turn, based on preliminary piping and instrumentation diagrams developed for the project. Estimated TAP emissions from component leakage are presented in Table 5.1-20.

Table 5.1-20. Fugitive Component Leak ~~Tap~~ TAP Emissions

Pollutant	CAS #	Emission Rate (lb/hr)	Emission Rate (lb/day)	Emission Rate (lb/year)
Benzene	71-43-2	5.7E-04	1.37E-02	4.99
Cyclohexane	110-82-7	1.0E-03	2.41E-02	8.81
Cyclopentane	287-92-3	5.1E-04	1.23E-02	4.50
Ethylbenzene	100-41-4	2.7E-04	6.51E-03	2.37
Hexane (-n)	110-54-3	3.1E-03	7.40E-02	26.99
Hydrogen Sulfide	7783-06-4	2.8E-05	6.62E-04	0.24
Isooctane	540-84-1	3.7E-05	8.87E-04	0.32
Isopentane	78-78-4	6.5E-03	1.56E-01	56.84
Isopropyl benzene	98-82-8	3.7E-05	8.95E-04	0.33
Pentane	109-66-0	6.6E-03	1.57E-01	57.41
Toluene	108-88-3	8.4E-04	2.02E-02	7.37
1,2,4-Trimethylbenzene	95-63-6	1.2E-04	2.94E-03	1.07
Xylene (-m)	108-38-3	9.2E-04	2.20E-02	8.04
Xylene (-o)	95-47-6	2.2E-04	5.29E-03	1.93
Xylene (-p)	106-42-3	2.5E-04	5.88E-03	2.15

Notes:
See Attachment 2 for detailed emissions calculations.

5.1.3 Applicable Regulations

This section discusses federal, state, and local air quality regulations and guidelines that potentially apply to the Facility.

5.1.3.1 Emission Standards

5.1.3.1.1 New Source Performance Standards

USEPA has established performance standards for a number of air pollution source categories in 40 Code of Federal Regulation (CFR) Part 60. These New Source Performance Standards (NSPS) represent a minimum level of control that is required on a new source. This section identifies those NSPS that apply to Facility emissions units.

Subpart A, General Provisions

Subpart A identifies monitoring, record-keeping, and notification requirements that apply generally to all NSPS subparts. Subpart A specifies that any performance (emissions) tests

[30] Protocol for Equipment Leak Estimates, U.S EPA 453-R95-017, November 1995

required by an NSPS must be conducted within 60 days of achieving maximum production rate at which the source will be operated, but not later than 180 days after initial startup.

Consistent with NSPS requirements, Tesoro-Savage will notify EFSEC and USEPA of commencement of construction of purpose-built facilities, the initial start-up date, the actual start-up date, and performance tests. Tesoro-Savage will also maintain records of start-ups and shutdowns, malfunctions of control equipment and periods of excess emissions if they occur.

Subpart Dc – Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units

The provisions of Subpart Dc apply to steam-generating units with a maximum design heat input capacity less than 100 MMBtu/hr and greater than 10 MMBtu/hr. The boilers associated with this project all fall within this capacity range. The particulate matter (PM) and SO_2 emission standards defined in Subpart Dc do not apply to units that are solely fueled by natural gas. Therefore, only the record keeping and reporting requirements of this Subpart are applicable. The provisions of this Subpart require that Tesoro-Savage maintain a record of the volume of natural gas burned in each boiler during each calendar month.

Subpart Kb – Standards of Performance for Volatile Organic Liquid Storage Vessels

The provisions of Subpart Kb apply to the crude oil storage tanks associated with the Facility. Subpart Kb regulates VOC emissions and establishes controls based on the vapor pressure of the stored liquid.

Because Facility will receive, store, and load a range of crude oils, some of which may have true vapor pressures within the applicable ranges addressed by Subpart Kb, it is assumed that Subpart Kb will apply to the Facility tanks. Subpart Kb identifies three control options. The Facility will incorporate the option identified in §60.112b(a)(1): A fixed roof in combination with an internal floating roof that floats on the liquid surface. A series of regulations for seals and closure devices related to roof contact must be followed.

Subpart IIII--Standards of Performance for Stationary Compression Ignition Internal Combustion Engines

The provisions of Subpart IIII apply to the emergency diesel fire water pump engines associated with the Facility. Subpart IIII regulates "NMHC+NOx" and PM and requires that the engine manufacturer certify that the engine will meet the standards in the rule; emission testing by the Facility is not required. Subpart IIII limits hours of non-emergency operation, mandates the use of ULSD and states that the owner or operator must keep records of the time of operation of the engine and the reason the engine was in operation during that time. Initial notification of installation is not required for emergency engines subject to Subpart IIII.

5.1.3.1.2 National Emissions Standards for Hazardous Air Pollutants

Under the provisions of Section 112 of the 1990 Clean Air Act Amendments, EPA was required to regulate emissions of a total of 189 HAPs from stationary sources.[31] EPA does this by specific

[31] EPA has since removed three HAPs from the list: caprolactum, ethylene glycol monobutyl ether, and methyl ethyl ketone (MEK).

industry categories to tailor the controls to the major sources of emissions and the HAPs of concern from that industry. The rules promulgated under Section 112 generally specify the Maximum Achievable Control Technology (MACT) that must be applied for a given industry category. Consequently, these rules are often called MACT standards.

MACT standards can require facility owners/operators to meet emission limits, install emission control technologies, monitor emissions and/or operating parameters, and use specified work practices. In addition, the standards typically include recordkeeping and reporting provisions. MACT standards are codified in 40 CFR Parts 61 and 63.

There are two types of HAP sources, “major” sources of HAP emissions and “area” sources of HAP emissions. Major sources are facilities that have a potential to emit more than 10 tons of a single HAP, or 25 tons of all HAPs combined. Area sources are facilities that are not a major source.

As reported in Section 5.1.2.2, facility-wide HAP emissions are less than 10 tons of a single HAP and less than 25 tons of aggregate HAPs. Therefore, the Facility will be an area source of HAP emissions. MACT standards that potentially apply to the proposed project are addressed below.

Parts 61 and 63, Subpart A, General Provisions
Subpart A establishes general requirements for reporting, testing, monitoring, and record-keeping for any major source facility. The Facility must send notifications to EFSEC and EPA of anticipated and actual start-up dates as defined in §63.9 and submit reports summarizing operations, emissions, and compliance with regulations and limits as specified in the standard.

Part 61, Subpart M – National Emission Standards for Asbestos
Subpart M of 40 CFR 61 establishes requirements related to asbestos in the event of demolition or remodeling. The Facility will comply with these requirements.

Part 63, Subpart Y – National Emission Standards for Hazardous Air Pollutants for Marine Tank Vessel Loading Operations
The emission standard provisions of Subpart Y apply to existing and new marine terminals that are major sources of HAPs or are associated with a major source of HAPs (such as a refinery). As noted above, the Facility is not in itself a major source of HAPs and is not associated with a major source of HAPs. ~~Consequently, Subpart Y does not apply to the Facility.~~ However, area sources such as the Facility are subject to the emission estimation (40 CFR §63.565(l)) and recordkeeping (40 CFR §63.567(j)(4)) requirements, and must meet the Coast Guard’s submerged fill standards (40 CFR §153.282). Because the Facility’s crude oil throughput will be less than 200 million barrels per year, it will not be subject to the RACT emission standards, per 40 CFR §63.560(b)(2).

Part 63, Subpart DDDDD -- National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters
The provisions of Subpart DDDDD apply to boilers and process heaters at major sources of HAPs. Because the Facility is not a major source of HAPs, Subpart DDDDD does not apply to the Facility boilers.

Part 63, Subpart JJJJJ -- National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers Area Sources

The Facility will be classified as an area source of HAPs and will operate boilers. However, gas-fired boilers are not subject to Subpart JJJJJJ. The Facility boilers will combust exclusively natural gas, so Subpart JJJJJ is not applicable.

Part 63, Subpart ZZZZ -- National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines

The provisions of Subpart ZZZZ apply to stationary reciprocating internal combustion engines (RICE) located at major and area sources of HAP emissions. A new stationary RICE located at an area source (such as the emergency firewater pump engines) must meet the requirements of Subpart ZZZZ by meeting the requirements of NSPS Subpart IIII for compression ignition engines. No further requirements apply for such engines under Subpart ZZZZ.

5.1.3.1.3 State Emission Limits

General standards for maximum emissions from industrial air pollution sources in Washington are outlined in WAC 173-400-040. This section limits visible emissions to 20% opacity except for 3 minutes per hour; controls nuisance dust particulate matter fallout, fugitive dust, and odors; and limits SO_2 emissions to no more than 1,000 ppm (hourly average, 7% O_2, dry basis). WAC 173-400-050 identifies emission standards for combustion and incinerator units, and limits process emissions to 0.1 grains per dry standard cubic foot at 7% O_2.

Washington also requires Best Available Control Technology (BACT) for new and modified emissions units. A BACT analysis identifies pollutant-specific alternatives for emission control, and the pros and cons of each alternative. The determination of which control scenario best protects ambient air quality is made on a case-by-case basis and considers the technical, economic, energy and environmental costs. Chapter 173-460 WAC requires that BACT also be employed to control emissions of TAPs (i.e., T-BACT). Generally, the same technologies or operations that reduce criteria pollutants also reduce TAPs.

5.1.3.2 Consistency with SWCAA Regulations

In addition to the general State emissions standards addressed in the preceding section, SWCAA has other regulations that would apply if the Facility were not subject to EFSEC's jurisdiction. Although they are not directly applicable, this section evaluates SWCAA's regulations to demonstrate that the Facility will be designed and operated consistent with those local requirements.

5.1.3.2.1 SWCAA General Regulations

The SWCAA regulations generally mirror Ecology's emission limits for new sources, limiting exhaust plume opacity to 20% opacity except for 3 minutes of any hour, particulate matter emissions to 0.1 grains per dry standard cubic foot, and SO_2 emissions to 1000 ppm. The Facility will comply with all local general emissions requirements because BACT imposes more stringent requirements.

5.1.3.2.2 SWCAA VOC Standards

SWCAA has established emission standards and control requirements for sources that emit VOCs. The Facility, as a source of VOC emissions, will be subject to the provisions of SWCAA 490 if it were under the jurisdiction of SWCAA.

SWCAA 490-040(2), Petroleum liquid storage tank requirements: Requires that all fixed-roof tanks storing volatile organic petroleum liquids with a true vapor pressure as stored greater than 78 mm of Hg (1.5 psi) at actual monthly average storage temperatures and having a capacity greater than one hundred fifty thousand liters (40,000 gallons) shall comply with one of the following:

- (i) Meet the equipment specifications and maintenance requirements of the federal standards of performance for new stationary sources - Storage Vessels for Petroleum Liquids (40 CFR 60, subpart K); or
- (ii) Be retrofitted with a floating roof or internal floating cover using a metallic seal or a nonmetallic resilient seal at least meeting the equipment specifications of the federal standards referred to in SWCAA 490-040 (2)(a)(i) or its equivalent; or
- (iii) Be fitted with a floating roof or internal floating cover meeting the manufacturer's specifications in effect when installed.

490-040 also requires that all seals be maintained in good operating condition and that seal fabric shall contain no visible holes, tears, or openings.

The Facility storage tanks will employ a fixed roof and internal floating cover and will therefore comply with 490-040 if under the jurisdiction of SWCAA. The Facility would be not be subject to the provisions of SWCAA 490-201 because that rule addresses petroleum storage in external floating roof tanks only.

5.1.3.2.3 SWCAA Maintenance Plan Requirements

Portions of the Portland-Vancouver metropolitan area (including the Facility site) have exceeded ozone and carbon monoxide ambient air quality standards in the past. Although the area currently meets ambient air quality standards, industrial sources in the area are still governed by "maintenance" plans intended to ensure air quality in the area does not deteriorate to the point where ozone and CO ambient standards are exceeded again. SWCAA administers those plans in the Washington portion of the maintenance area with certain elements of the maintenance plan integrated into the SWCAA regulations. Each SWCAA requirement is presented after a bullet below, and followed by an explanation of how the Facility complies with that requirement.

- SWCAA 400-111, Requirements for New Sources in a Maintenance Plan Area: SWCAA 400-111 implements portions of the State Implementation Plan (SIP) for the Vancouver CO and ozone maintenance areas[32]. Both maintenance areas cover the same geographic area, extending over the urban and industrial regions of Vancouver. SWCAA 400-111 requires that no approval to construct a new source shall be granted unless:

    a) Emissions from all units will comply with applicable emissions standards including NSPS and MACT standards.

[32] Vancouver, WA ozone and carbon monoxide maintenance plans are available for download from http://www.swcleanair.org/maintenanceplans.html

b) Emissions from the new source will be minimized to comply with emissions levels and other requirements within the maintenance plan.

c) BACT will be employed for all pollutants emitted from units associated with the new source.

d) Emissions from the new source will not cause any violation of an ambient air quality standard

e) The source will employ control equipment and take measures to control emissions of TAPs to comply with WAC 173-460.

Although the EFSEC approval process supersedes SWCAA regulations, the Facility would comply with this regulation were it subject to SWCAA jurisdiction.

- SWCAA 400-111(2) indicates that a source located within the maintenance area may have to apply Lowest Achievable Emission Rate (LAER) emission limits if any ambient air quality standard is violated within the CO or O_3 maintenance areas.

According to SWCAA (2007)[33], the region has been in compliance with CO NAAQS since 1992 and future exceedance is not anticipated. Also, according to SWCAA (2006)[34], the region is in compliance with the ozone standards and future exceedance is not expected in the immediate future. Facility-wide emissions of ozone precursors and carbon monoxide are low and do not threaten compliance with the CO and ozone ambient standards. Consequently, this regulation would not apply to the Facility even if it were subject to SWCAA regulations.

- SWCAA 400-111(5) states that if a new source located within the maintenance area is designated as "major"[35] then emission offsets are required. Offsets are reductions in pollutant emissions equivalent to or greater than the proposed increases, provided by other stationary sources emitting the same pollutant.

Because the Facility is not a major source of carbon monoxide or ozone precursors, offsets would not be required even if the Facility were subject to SWCAA regulations.

- SWCAA 400-113(3) requires that allowable emissions from a proposed new source do not result in a significant increase in ambient concentrations within a maintenance area. This provision therefore requires that a source demonstrate that the project emissions will not result in exceedance of significant impact levels (1 $\mu g/m^3$ NO_2 annual average, 0.5 mg/m^3 CO 8-hour average, or 2 mg/m^3 CO 1-hour average) within the Vancouver maintenance area. If a SIL is exceeded then emission offsets must be obtained. Offsets must be sufficient enough to lower the modeled ambient concentration below the indicated impact level.

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[33] SWCAA (2007): Vancouver Air Quality Maintenance Area Second 10-year Carbon Monoxide Maintenance Plan, Supplement to the Washington State SIP, SWCAA, March 1, 2007.

[34] SWCAA (2006): Vancouver Portion of the Portland-Vancouver AQMA Ozone Maintenance Plan, Supplement to the Washington State SIP, SWCAA, November 2, 2006.

[35] A "major" stationary source is defined in SWCAA 400-030 (62)(a) as a source located in a maintenance plan or non-attainment area that emits or has the potential to emit 100 tons per year or more of any criteria pollutant (lower thresholds apply for PM and CO in non-attainment areas).

This regulation is intended to ensure that sources outside the maintenance area do not adversely affect compliance within the maintenance area. As noted above, the Facility is within the maintenance areas but its emissions are below the major source thresholds that trigger LAER and offsets.

5.1.3.3 Preconstruction Permitting

5.1.3.3.1 Notice of Construction and Application for Approval

WAC 173-400-110 requires a NOC application for the construction of new air contaminant sources in Washington. SWCAA maintains a similar regulation (SWCAA 400-109) for new or modified sources in its jurisdiction. The NOC application provides a description of the facility and an inventory of pollutant emissions and controls. The reviewing agency, EFSEC, considers whether BACT has been employed and evaluates ambient concentrations resulting from these emissions to ensure compliance with ambient air quality standards. Pollutant emissions not governed by the PSD permit process are addressed in an Order of Approval that results from the NOC application. In the case of the Facility, all pollutants except greenhouse gases are addressed in the NOC application.

5.1.3.3.2 Prevention of Significant Deterioration (PSD)

For the Facility, EFSEC and USEPA administer the PSD permit process. The PSD regulations were established by USEPA to ensure that new or expanded major stationary sources that emit Clean Air Act-regulated pollutants above a significance rate do not cause air quality in areas that currently meet the standards (i.e., attainment areas) to deteriorate significantly. These regulations require the application of BACT, and set PSD increments, which limit the increases in SO_2, NO_2 and PM concentrations that may be produced by a new source. Increments have been established for three land classifications. The most stringent increments apply to Class I areas, which include wilderness areas and national parks. The vicinity of the site is designated Class II, where less stringent PSD increments apply. There are no Class III areas in Washington so those increments are not pertinent to this analysis.

The Facility will be subject to PSD regulations because it will emit more than 100,000 tons per year of greenhouse gases (See Table 5.1-12). Once subject to the PSD process, emissions of other regulated pollutants that exceed specific significant emission rates must be evaluated. However, facility-wide emissions of all regulated air pollutants other than greenhouse gases are less than the significant emission rates established in the PSD regulations. Consequently, only greenhouse gas emissions are subject to review in the PSD process.

5.1.4 Local Air Quality Impact Assessment

This section describes the local Air Quality Impact Assessment (AQIA) that has been conducted for the Facility. Computer-based dispersion modeling techniques were applied to simulate dispersion of toxic and criteria pollutant releases from Facility emissions units to estimate pollutant concentrations in the neighboring area. The results of the modeling analyses are used to assess compliance with NAAQS, WAAQS, and Ecology's ASILs for TAPs.

The dispersion modeling techniques employed in the analysis follow the USEPA regulatory guidelines (40 CFR Part 51, Appendix W). These guidelines include recommendations for model selection, data preparation, and model application, but allow flexibility on a case-by-case basis.

Section 5.1.4.1 summarizes stack parameters used for the simulation. Section 5.1.4.2 describes the data used to characterize existing ambient air quality and discusses the meteorological data used in the dispersion modeling. Dispersion model selection and application are described in Section 5.1.4.3, followed by a summary of the model results in Section 5.1.4.4.

Typically, PSD permit applications examine whether emissions attributable to a proposed facility exceed Class II and Class I PSD increments and evaluate air quality related values in Class I areas. For the Facility, however, greenhouse gases are the only pollutant subject to PSD review, and there are no increments or air quality related values established for greenhouse gases.

5.1.4.1 Stack Parameters, Building Dimensions, and Good Engineering Practice

In addition to emission rates, the modeling analysis requires estimates of the stack heights, building dimensions, and other parameters that characterize exhaust flows and/or atmospheric release characteristics from a facility. These release characteristics have an important influence on initial dispersion of emissions. The stack parameters used in the dispersion modeling simulation of Facility operations are presented in Table 5.1-21.

The effect of building wakes (i.e., downwash) on stack plumes was evaluated in accordance with USEPA guidance. Direction-specific building data were generated for stacks below good engineering practice (GEP) stack height, using the most recent version of USEPA Building Parameter Input Program – Prime (BPIP-Prime). The AERMOD model considers direction-specific downwash using both the Huber Snyder and Schulman-Scire algorithms, as represented in the BPIP-Prime program. Figure 5.1-1 shows the major structures that were used in the BPIP-Prime analysis.

Table 5.1-21. Stack Parameters

Source	Stack Base Elevation above Sea level (m)	Stack height (m)	Temperature (K)	Exit velocity (m/s)	Stack diameter (m)
~~Storage~~ Area 300 Boiler 1	10	13.72	508~~.15~~	10.85	0.51
Area 300 Boiler 2	10	13.72	508		
~~Unloading~~ Area 600 Boiler1	9	19.81	504~~.26~~	10.72	1.07
~~Unloading~~ Area 600 Boiler2	9	19.81	504~~.26~~	10.72	1.07
~~Unloading~~ Area 600 Boiler3	9	19.81	504~~.26~~	10.72	1.07
VCU1	10	7.36	1478~~7.59~~	39.62	1.12
VCU2	10	7.36	1478~~7.59~~	39.62	1.12
VCU3	10	7.36	1478~~7.59~~	39.62	1.12
VCU4	10	7.36	1478~~7.59~~	39.62	1.12
VCU5	10	7.36	1478~~7.59~~	39.62	1.12
VCU6	10	7.36	1478~~7.59~~	39.62	1.12
VCU7	10	7.36	1478~~7.59~~	39.62	1.12
VCU8	10	7.36	1478~~7.59~~	39.62	1.12
Emergency Firewater Pump 1	10	3.35	787~~6.82~~	73.55	0.10
Emergency Firewater Pump 2	11	3.10	787~~6.82~~	73.55	0.10
Emergency Firewater Pump 3	9	3.10	787~~6.82~~	73.55	0.10

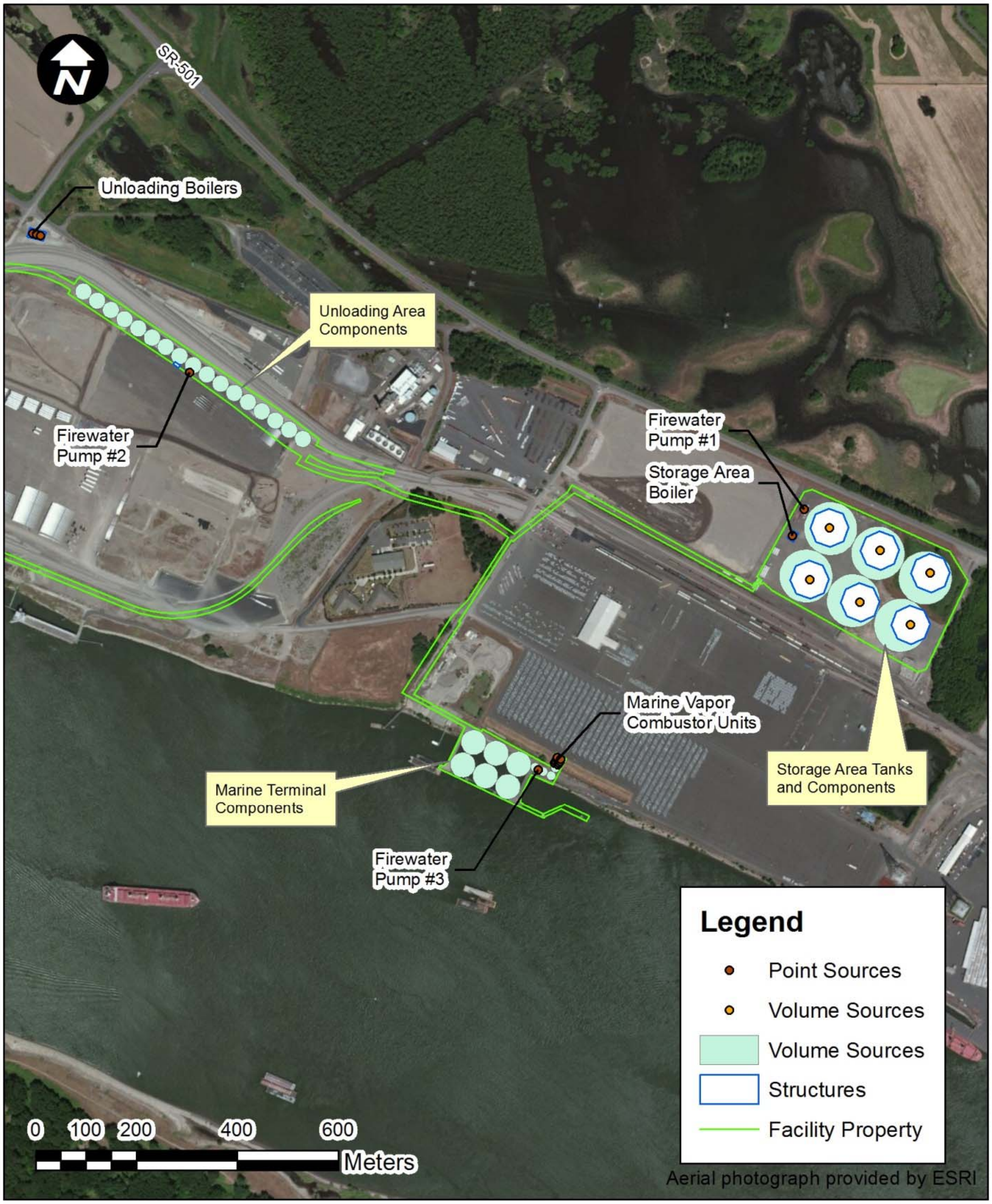

Figure 5.1-1. Site Plan with Emission Units and Property Boundary

5.1.4.2 Local Meteorology and Air Quality

5.1.4.2.1 Local Meteorology

A meteorological database for the dispersion modeling was constructed using the best available surface and upper air data. A survey of available meteorological data was conducted for use in the simulations. For surface meteorological data, the closest and most representative National Weather Service (NWS) station was Pearson Field, located in Vancouver. The most appropriate upper air data was from McNary field airport, in Salem Oregon. A five year meteorological database was created using the most recent available years of data: 2008 through 2012.

Figure 5.1-2 displays a wind rose constructed from the five years of hourly meteorological data. The average wind velocity for the five year period is 2.32 meters per second (m/s) and periods of calm winds occur 5.72 percent of the time.

Additional meteorological variables and geophysical parameters are required by the dispersion modeling analysis to estimate the surface energy fluxes and construct boundary layer profiles. Surface characteristics including the surface roughness length, albedo, and Bowen ratio were assigned on a sector-by-sector basis using land use within one kilometer of Pearson Field. The USGS 1992 National Land Cover (NLCD92) land use data set used in the analysis has a 30 m mesh size and over 30 land use categories.[36]

The NLCD92 data were processed using the utilities that accompany the AERMOD modeling system. Land use was characterized in eight upwind sectors surrounding the site. Within each sector a weighted average surface roughness length, albedo, and Bowen ratio was calculated from the characteristics recommended for each land use by the AERSURFACE program. Arithmetic averages were used for the albedo and Bowen ratio, while a geometric or logarithmic average was used for surface roughness length.

The USEPA meteorological program AERMET was used to combine the Pearson Field observations with twice daily upper air soundings from Salem and derive the necessary variables for AERMOD. The upper air data are used to estimate the temperature lapse rate aloft and subsequently by AERMET to predict the development of the mixed layer height. The Bulk-Richardson option was used to estimate dispersion variables and surface energy fluxes during nocturnal periods, while solar radiation and wind speed are used by AERMET to estimate these same variables during the day. The sigma-theta data from the Pearson Field site are passed through by AERMET to AERMOD for the lateral dispersion algorithms.

[36] The USGS NLCD92 data set is described and can be accessed at http://landcover.usgs.gov/natllandcover.php.

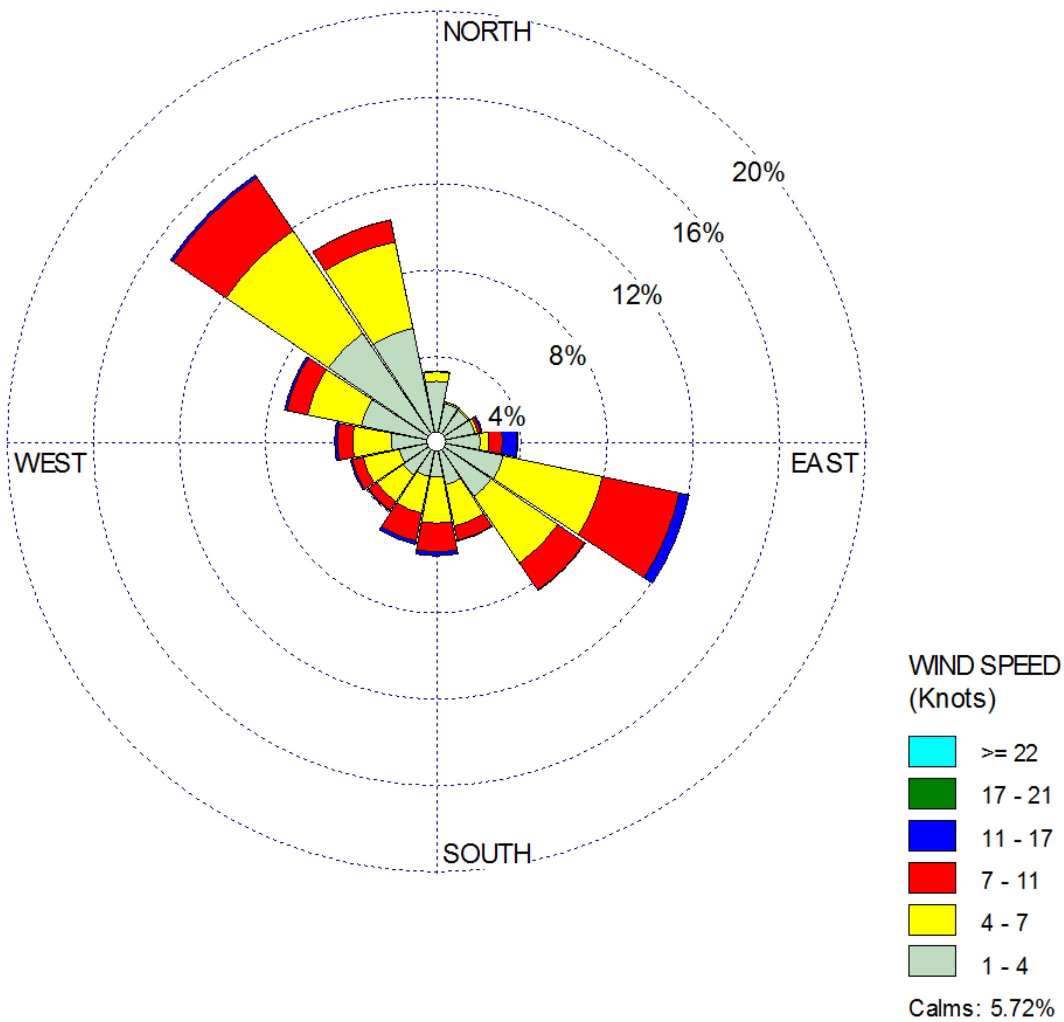

Figure 5.1-2. Pearson Field Airport Windrose from 2008-2012

5.1.4.2.2 Background Air Quality

Ecology and USEPA designate regions as being “attainment” or “nonattainment” areas for particular air pollutants based on monitoring information collected over a period of years. Attainment status is therefore a measure of whether air quality in an area complies with the health-based ambient air quality standards. The Facility is located in a region considered to be in attainment for all criteria pollutants, but it remains subject to maintenance plans that ensure continued compliance with ozone and carbon monoxide ambient standards.

Existing air quality at the Facility site can be inferred from several sources of information. First, conditions can be estimated from measurements collected by Ecology and the Oregon Department of Environmental Quality air quality monitoring networks. Current and archived air quality data are accessible from the EPA AirData website.[37] The 2012 AirData database files for several monitoring sites near to the project site were accessed to characterize background air quality. The values reported at these sites represent the conservatively highest background air quality values in the region because monitoring sites are often specifically selected to identify the highest regional pollutant concentrations. Air quality values for each pollutant were estimated using measurements from the following monitors:

CO: SE Lafayette, Portland, Oregon, EPA AQS Site No. 41-051-0080 (about 10 miles SE of the project site), 2012 maximum and second highest maximum values.

NO_2: SE Lafayette, Portland, Oregon 2011 Annual mean, 2012 1-hour maximum and 98th percentile daily maximums.[38]

Ozone: Sauvie Island, Oregon, EPA AQS Site No. 41-009-0004 (about 8 miles north-northwest of the project site), 2011 8-hour maximum and fourth highest 8-hour maximum values.

$PM_{2.5}$: Fourth Plain Boulevard East, Vancouver, Washington, EPA AQS Site No. 53-011-0013 (about 10 miles east of the project site), 2012 24-hour maximum and 98th percentile concentrations, annual average estimated using annual average of 1-hour values.

PM_{10}: N. Roselawn Emerson Playfield, Portland, Oregon, EPA AQS Site No. 41-051-0246 (about 7 miles southeast of the project site), 2012 24-hour average maximum value and 98th percentile 24-hour average value, annual average estimated using annual average of 24-hour values.

SO_2: SE Lafayette, Portland, Oregon, EPA AQS Site No. 41-051-0080, 2012 maximum and 99th-percentile 1-, 3-, and 24-hour values. Annual average estimated using annual average of 1-hour values.

Background concentrations can also be estimated using a tool provided by Ecology. Ecology provides the 2009-2011 "design values" for background air quality throughout the state using the output from the AIRPACT-3 regional air quality model, with adjustments from assimilated monitor data. The tool is a product of the Northwest International Air Quality Environmental Science and Technology Consortium and is used to support air permitting and regulation in the State.[39] Use of this database may provide a more accurate estimate of the actual background air quality at the project site than the conservative measurements from the monitoring network. Design values were collected in July 2013 using the tool for project site coordinates (46.643 Lat., -122.705 Long.).

The background air quality values estimated from these sources of information are listed in Table 5.1-22.

[37] U.S. EPA AirData website archive of monitoring data. http://www.epa.gov/airquality/airdata/
[38] Reported in Oregon Dept. of Environ. Quality (2012): 2011 Oregon Air Quality Data Summaries, DEQ 11-AQ-021
[39] NW-Airquest "design values" tool website: http://lar.wsu.edu/nw-airquest/index.html

Table 5.1-22. Existing Air Quality

Pollutant	Averaging Time	State Monitoring Network Maximum Value	State Monitoring Network Regulatory Value[1]	Design Value
CO	1-hour	3.8 ppm	3.1 ppm (2nd high)	2.065 ppm
	8-hour	2.3 ppm	2.2 ppm (2nd high)	1.276 ppm
NO_2	1-hour	59 ppb	36 ppb (98th %-ile.)	37 ppb
	Annual	9 ppb	9 ppb	7 ppb
O_3	1-hour	0.068 ppm	0.064 ppm (4th high)	NA[3]
	8-hour	0.057 ppm	0.053 ppm (4th high)	0.056 ppb
$PM_{2.5}$	24-hour	31.2 μg/m^3	20.5 μg/m^3 (98th %-ile)	20 μg/m^3
	Annual	7.0 μg/m^3	NA[3]	5.8 μg/m^3
PM_{10}	24-hour	36 μg/m^3	34 μg/m^3 (98th %-ile)	31 μg/m^3
	Annual	13 μg/m^3	NA[3]	NA[3]
SO_2	1-hour	9.8 ppb	4.9 ppb (99th %-ile)	9.5 ppb
	3-hour	7.0 ppb	2.7 ppb (99th %-ile)	7.1 ppb
	24-hour	2.5 ppb	1.7 ppb (99th %-ile)	3.6 ppb
	Annual	1.5 ppb	NA[3]	3 ppb

Notes:
[1] Values that are applicable for comparison to the NAAQS.
[2] Facility site Design Value obtained from NW-Airquest/ Dept. of Ecology
[3]NA: Not available

5.1.4.3 Dispersion Model Selection and Application

The most recent version (12345) of AERMOD was used for the air quality modeling. AERMOD is the preferred USEPA guideline model for near-field simulation of industrial stack releases. AERMOD was used to model concentrations of pollutants having short-term (e.g., one to 24 hour) ambient standards with the appropriate averaging time selected. Modeling of pollutants having annual standards (i.e., $PM_{2;5,}$ SO_2 and NO_2) was conducted using AERMOD with the PERIOD option.

An analysis of the land use adjacent to the Facility site was conducted in accordance with Section 7.2.3 of the Guideline on Air Quality Models (USEPA, 2005 and Auer, 1978). The land use analysis within 3 kilometers of the site was determined to be predominantly rural, such that rural dispersion coefficients were selected for all Facility simulations. All AERMOD regulatory default settings were selected.

Concentrations attributable to Facility emissions units are calculated at simulated locations referred to as model receptors. The receptor grids used in the modeling analyses are as follows:

- 25-meter spacing along the property line and extending from the property line out to 3 km beyond the property line;
- 50-meter spacing from 3 km to 4 km from the property line;
- 200-meter spacing from 4 km to 5 km from the property line; and
- 5,000-meter spacing from 5 km to 10 km from the property line.

Actual Universal Transverse Mercator (UTM) NAD27 coordinates and digital terrain data provided by the USGS were used in all receptor grids.

Figure 5.1-3 shows the receptor grids used in the modeling overlaid on a topographic map.

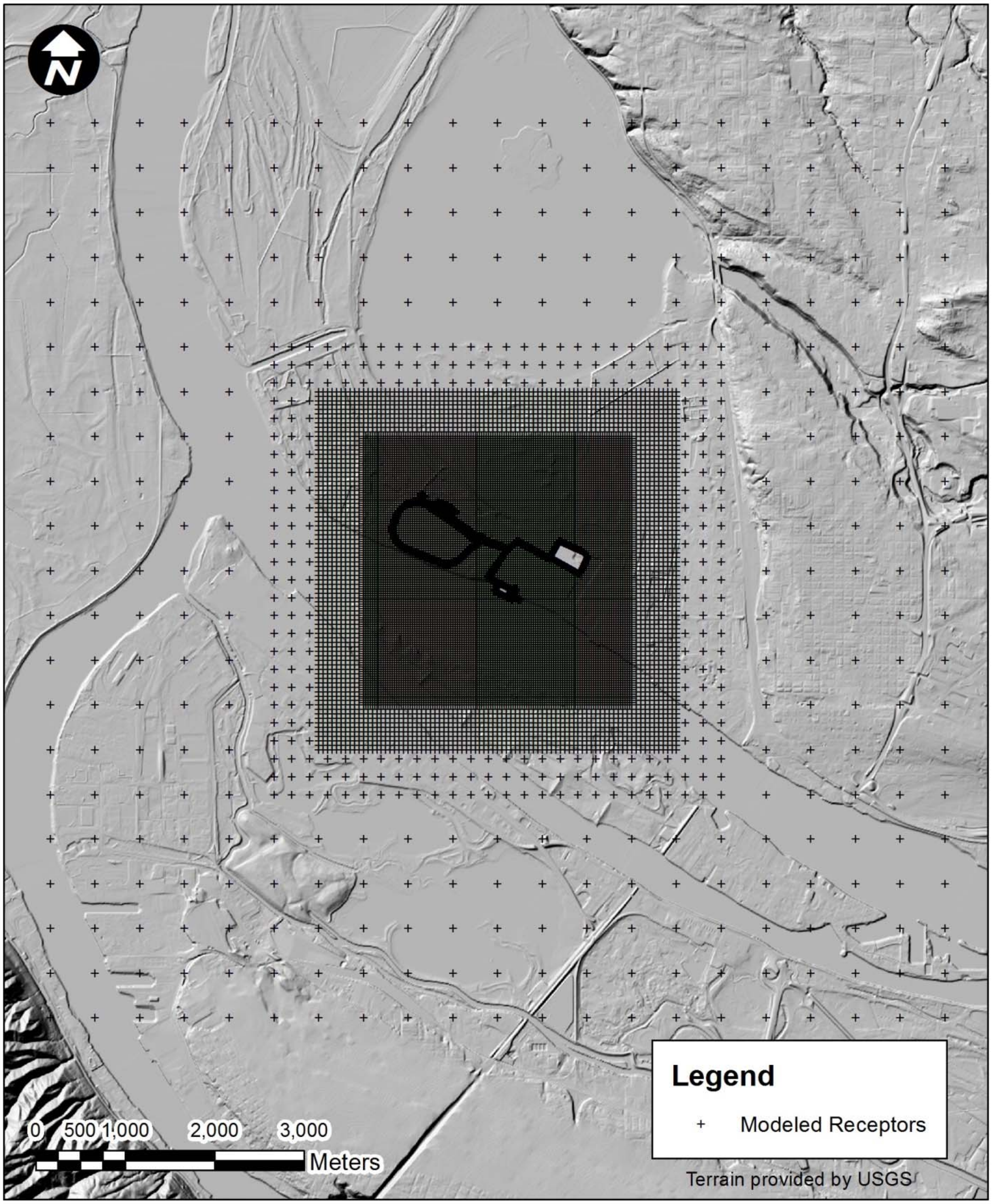

Figure 5.1-3. Modeling Receptor Grids

5.1.4.4 Dispersion Model Results

5.1.4.4.1 Criteria Pollutants

The criteria pollutant concentrations predicted using AERMOD to evaluate Facility operations are presented in Table 5.1-23. All maximum modeled concentrations occurred within one km of the Facility. In order to assess the significance of the predicted values, the maximum predicted criteria pollutant concentrations attributable to the Facility are compared with the USEPA Significant Impact Levels (SILs); concentrations below the SILs are considered to be insignificant, and these pollutants do not require cumulative modeling with other sources to demonstrate compliance with ambient air quality standards.

Table 5.1-23. Maximum predicted concentrations attributable to the facility

		~~Maximum Modeled Concentration~~				~~PSD SIL~~
~~Pollutant~~	~~Averaging Period~~	~~(µg/m³)~~	~~UTM X (m)~~	~~UTM Y (m)~~	~~Position Relative To Facility~~	~~(µg/m3)~~
~~PM_{10}~~	~~Annual~~	~~0.1~~	~~520700~~	~~5055505~~	~~Northwest~~	~~1~~
	~~24-hour~~	~~8.8~~	~~520698~~	~~5055495~~	~~Northwest~~	~~5~~
~~$PM_{2.5}$~~	~~Annual~~	~~0.1~~	~~520701~~	~~5055505~~	~~Northwest~~	~~0.3~~
	~~24-hour~~	~~8.8~~	~~520698~~	~~5055496~~	~~Northwest~~	~~1.2~~
~~SO_2~~	~~Annual~~	~~0.3~~	~~520701~~	~~5055505~~	~~Northwest~~	~~1~~
	~~24-hour~~	~~10.8~~	~~520698~~	~~5055496~~	~~Northwest~~	~~5~~
	~~3-hour~~	~~19.5~~	~~520698~~	~~5055496~~	~~Northwest~~	~~25~~
	~~1-hour~~	~~28.6~~	~~522367~~	~~5054940~~	~~Northeast~~	~~7.8~~
~~NO_2~~	~~Annual~~	~~0.8~~	~~520701~~	~~5055505~~	~~Northwest~~	~~1~~
	~~1-hour~~	~~19.5~~	~~521885~~	~~5054360~~	~~Southeast~~	~~7.5~~
~~CO~~	~~8-hour~~	~~50.5~~	~~520699~~	~~5055496~~	~~Northwest~~	~~500~~
	~~1-hour~~	~~87.5~~	~~520699~~	~~5055496~~	~~Northwest~~	~~2,000~~

Pollutant	Averaging Period	Maximum Modeled Concentration: Value (µg/m³)	UTM X (m)	UTM Y (m)	Position Relative to Facility	PSD SIL (µg/m³)
NO_2	1-hour	28.6	520703.6	5055515	Northwest	7.5
	Annual	0.832	520701	5055505	Northwest	1
SO_2	1-hour	28.6	522366.7	5054940	Northwest	7.8
	3-hour	20.8	521052.1	5055195	Northwest	25
	24-hour	12.8	520698.4	5055496	Northwest	5
	Annual	0.280	520701	5055505	Northwest	1
PM_{10}	24-hour	13.3	520698.4	5055496	Northwest	5
	Annual	0.209	520701	5055505	Northwest	1
$PM_{2.5}$	24-hour	13.3	520698.4	5055496	Northwest	1.2
	Annual	0.209	520701	5055505	Northwest	0.3
CO	1-hour	90.9	520703.6	5055515	Northwest	2,000
	8-hour	75.0	520703.6	5055515	Northwest	500

Predicted SO2, CO, and annual PM and NO2 concentrations attributable to Facility emissions units are less than USEPA SILs. Based on procedures that apply to PSD permits, this finding indicates that Facility emissions of those pollutants will not significantly affect ambient air concentrations.

Short term concentrations of PM and NO2 exceed their respective SILs, and it is common to evaluate cumulative concentrations by adding existing "background" concentrations to the predicted concentrations attributable to the Facility. The air quality monitoring data from selected monitoring sites in Washington and Oregon, as summarized in Section 5.1.4.2.2, provide a conservative assessment of background air quality. Table 5.1-24 identifies cumulative concentrations based on the sum of these conservative background concentrations and the highest modeled concentrations from the Facility. The analysis indicates that when maximum predicted concentrations are added to the highest monitored values, total concentrations comply with Washington and National ambient air quality standards.

Table 5.1-24. Comparison of Cumulative Concentrations with Ambient Air Quality Standards

Pollutant	Averaging Period	Maximum Modeled Concentration	Measured Background Concentration	Maximum Total Concentration	NAAQS	WAAQS
		($\mu g/m^3$)				
NO_2	1-hour	~~19.5~~28.6	70	~~89.1~~98.2	188	-
NO_2	Annual	~~0.8~~0.832	13	14.0	100	100
SO2	1-hour	28.6	25	53.5	196	655
SO_2	3-hour	~~19.5~~20.8	19	~~38.1~~39.4	1300	-
SO_2	24-hour	~~10.8~~12.8	9	~~20.2~~22.3	-	262
SO_2	Annual	~~0.3~~0.280	8	~~8.1~~8.14	-	52
PM_{10}	24-hour	~~8.8~~13.3	31	~~39.8~~44.3	150	150
PM_{10}	Annual	~~0.1~~0.209	13	13.2~~1~~	-	50
$PM_{2.5}$	24-hour	~~8.8~~13.3	20	~~28.8~~33.3	35	-
$PM_{2.5}$	Annual	~~0.1~~0.209	6	~~5.9~~6.01	15	-
CO	1-hour	~~87.5~~90.9	2364	~~2451.9~~2,455	40,000	40,000
CO	8-hour	~~50.5~~75.0	1461	~~1511.5~~1,536	10,000	10,000

Note:
Although it is assumed that all PM_{10} emissions are $PM_{2.5}$, predicted concentration differ because of the difference in the statistics used to determine compliance with the standard.

5.1.4.4.2 Toxic Air Pollutants

WAC 173-460 regulates emissions of almost 400 substances as toxic air pollutants (TAPs). When anticipated emissions of a given TAP exceed a prescribed "Small Quantity Emission Rate for that TAP, EFSEC requires permit applications to include dispersion modeling of TAP emissions and to include a comparison of calculated concentrations attributable to the project with the ASILs. If calculated concentrations are less than the ASILs, a permit can be granted without further analysis. Otherwise, the Applicant must revise the project or submit a health risk assessment demonstrating that toxic emissions from the project are sufficiently low to protect human health. Concentrations below the ASILs indicate insignificant potential for adverse health effects from these chemicals.

Table 5.1-14 identifies facility-wide TAP emissions and was used to determine whether facility-wide emissions of each TAP exceed its SQER. A dispersion modeling analysis for those TAPs emitted at rates exceeding the SQERs was conducted in the same manner as for the criteria pollutants.

Maximum predicted TAP concentrations attributable to the Facility emission units are compared with Ecology ASILs in Table 5.1-25. Predicted concentrations are less than the Ecology ASILs for all TAPs.

Table 5.1-25. Maximum Predicted ~~Tap~~ TAP Concentrations

CAS #	Compound	Maximum Predicted Concentration (ug/m3)	ASIL (ug/m3)
10102-44-0	Nitrogen dioxide	~~19.5~~28.6	470
7446-09-5	Sulfur dioxide	28.6	660
57-97-6	7,12-Dimethylbenz(a)anthracene	1.20E-06	1.41E-05
7440-38-2	Arsenic	1.50E-05	3.03E-04
71-43-2	Benzene	2.36E-02	3.45E-02
7440-43-9	Cadmium	8.26E-05	2.38E-04
18540-29-9	Chromium, (hexavalent)	4.19E-06	6.67E-06
N/A	Diesel Engine Particulate	1.45E-03	3.33E-03